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16. Abstract Urban sprawl, driven by population and economic growth, is a pressing issue in the U.S., partly because of its contribution to growing levels of vehicle miles traveled (VMT). According to government figures, new development is gobbling up land at an alarming rate of 365 acres per hour (Natural Resources Defense Council 2002). Between 1960 and 1990, the amount of developed land in metro areas more than doubled, while the population grew by less than half (National Resource Defense Council 2001). In response, various efforts to mitigate urban sprawl have been and are being developed and implemented in different contexts and with different intents under the popular umbrella of "smart growth." Transportation plays an important role in these efforts. Transportation investments and policies can be used to influence development patterns, and policies that promote more compact development can help to slow the growth in VMT. This report identifies transportation-related and growth-management strategies and policy actions used in smart growth efforts and catalogues them with respect to goals, characteristics, and suitability factors in the form of six matrices, designed as a guide for communities in Texas in the selection of sprawl mitigation techniques appropriate to their specific contexts. The matrices were developed based on an extensive review of the literature and a review by an expert panel of leading land use and transportation researchers. The report discusses the problem of urban sprawl and efforts to mitigate it, describes the development of the matrices, presents the matrices and supporting materials, presents two Texas applications of the matrices in case study form, and discusses future research needs.			
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Techniques for Mitigating Urban Sprawl

Dr. Robert Paterson
Dr. Susan Handy
Dr. Kara Kockelman
Dr. Chandra Bhat
Jumin Song
Jayanthi Rajamani
Juchul Jung
Kari Banta
Urvi Desai
John Waleski

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TEXAS DEPARTMENT OF TRANSPORTATION

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CHAPTER 1. INTRODUCTION

Urban sprawl, driven by population and economic growth, is a pressing issue in the U.S. According to government figures, new development is gobbling up land at an alarming rate of 365 acres per hour (Natural Resources Defense Council 2002). Between 1960 and 1990, the amount of developed land in metro areas more than doubled, while the population grew by less than half (National Resource Defense Council 2001). The contribution of sprawl to a variety of problems in metropolitan areas has been well documented: traffic congestion, air and water pollution, equity of economic opportunity, and so on. In response, various efforts to slow urban sprawl and mitigate its effects have been and are being developed and implemented in different contexts and with different intents under the popular umbrella of "smart growth." Transportation plays an important role in these efforts: transportation investments and policies can be used to influence development patterns, and policies that promote more compact development can help to slow the growth in vehicle miles traveled (VMT). However, the list of possible smart growth strategies is long, and transportation agencies and other planning agencies are often at a loss as to what strategies make the most sense for their communities. The challenge is especially acute in states like Texas that have a limited tradition in land use planning and development management.

The purpose of this project was to identify transportation-related and growth-management strategies and policy actions used in smart growth efforts and catalogue them with respect to goals, characteristics, and suitability factors. This catalogue is presented in the form of six matrices, designed as a guide for communities in Texas and elsewhere in the selection of sprawl mitigation techniques appropriate to their specific contexts. This report presents important background for this effort, including an introduction to the topic of urban sprawl in the remainder of this chapter, a discussion of the connections between transportation and smart growth in Chapter 2, and an overview of state department of transportation (DOT) sprawl mitigation efforts in Chapter 3. Chapter 4 presents the sprawl mitigation matrices and Chapter 5 presents two Texas case examples where we apply the matrices to identify likely areas to enhance state, regional, and local efforts to manage sprawl. Chapter 6 concludes the report with a discussion of future research needs. The remainder of this chapter provides an overview of various definitions of sprawl in the literature, the primary causes of sprawl, its negative and

positive impact, factors that indicate or characterize sprawl, and ways of measuring sprawl. The final section of this chapter introduces the concept of smart growth as a tool for mitigating sprawl.

1.1 DEFINITION OF SPRAWL

One of the earliest uses of the word "sprawl" in terms of land use was in a 1937 speech by Earle Draper, then director of planning for the Tennessee Valley Authority: "Perhaps diffusion is too kind a word. ... In bursting its bounds, the city actually sprawled and made the countryside ugly, uneconomic in terms of services and doubtful social value." Since then, numerous research efforts have attempted to characterize and explain urban sprawl. However, the continually expanding body of literature provides no consensus on the definition or characteristics of sprawl. To complicate matters, the term "sprawl" is applied in many different ways (Galster, et al. 2000): as an aesthetic judgment about a general urban development pattern; as a cause of an externality, such as high automobile dependence, isolation of the poor in the inner city, or loss of air quality; as the consequence or effect of some independent variable, such as fragmented local government, "poor" planning, or exclusionary zoning; or as comparisons with cities such as Los Angeles.

The multifaceted nature of sprawl leads to different definitions from a diverse set of fields. Most definitions refer to the low-density and uncontrolled expansion of urban areas into suburbia. For example, *London Times* (1955) defined sprawl as the "straggling expansion of an indeterminate urban or industrial environment into the adjoining countryside." Similarly, the *Vermont Forum* on sprawl defined it as "dispersed development outside of compact urban and village centers along highways and rural countryside." While some studies have concentrated on the inefficient and chaotic patterns of suburban development generated by sprawl (Kuntsler 1994*)*, some others have focused on the automobile-dependent aspect of sprawling development (USHUD 1999). Nelson and Duncan (1995) present a synthesized definition of urban sprawl as "unplanned, uncontrolled and uncoordinated single-use development that does not provide for an attractive and functional mix of uses and/or is not functionally related to surrounding land uses and which variously appears as low density, ribbon or strip, scattered, leapfrog or isolated development." In summary, urban sprawl is a term that has been used to describe a variety of

conditions. It has been associated with *patterns* of residential and nonresidential land use, the *process* of extending the reach of urbanized areas (UAs), the *causes* of particular practices of land use, and the *consequences* of those practices. Sprawl has been denounced on aesthetic, efficiency, equity, and environmental grounds and defended on grounds of choice, equality, and economy (Galster, et al. 2000).

Although the term "sprawl" has numerous interpretations, a set of attributes may be considered to characterize sprawl. For the purpose of this project, the ten traits identified by Downs (1998) are used to define sprawl:

1. Unlimited outward extension
2. Low-density residential and commercial settlements
3. Leapfrog development, which leaves large areas undeveloped but fails to provide functional open space
4. Fragmentation of powers over land use among many small localities
5. Dominance of transportation by private automobile vehicles
6. No centralized planning or control of land uses
7. Widespread strip commercial development
8. Great fiscal disparities among localities
9. Segregation of types of land uses in different zones
10. Main reliance on the trickle-down or filtering process to provide housing to low-income households; no low-income households outside central cores

1.2 CAUSES OF SPRAWL

According to Fishman (1987), the development of the suburbs in postwar America addressed two conflicting goals: to accommodate households relocating to the suburbs, and to provide the semirural environment that suburbanites sought. These competing goals led to the "hopeless jumble of housing, industry, commerce and even agriculture" that characterizes today's suburbs (Fishman 1987). According to Nelson and Duncan (1995), urban sprawl is primarily a product of American affluence. Rising standards of living in the postwar period enabled the majority of families to afford an automobile and a house located a considerable

distance from work. The suburban boom leading to sprawl was fueled by national investment policies, generous subsidies, and outright discrimination against high-density development (Nelson and Duncan 1995). Some of the major factors that may contribute to sprawl are as follows:

1.2.1 Investment Policies

Nelson and Duncan (1995) point out that the construction of interstate highways, federal transportation investment policies encouraging construction of new roads over maintenance of existing roads, or development of alternative transport modes have contributed to sprawl.

1.2.2 Development Policies and Regulations

Subsidies and regulatory incentives for businesses to relocate from cities and suburbs to previously undeveloped areas contribute to sprawl. Businesses tend to relocate to take advantage of tax incentives and avoid higher land and capital costs in downtown areas (FSCC 1998). The mortgage insurance system, which favors single-family dwellings, has also encouraged low-density suburban development and, until recent changes in tax laws, national tax policy encouraged people to always buy bigger new homes to avoid capital gains (Snyder and Bird 1998).

1.2.3 Speculation

Nelson and Duncan (1995) claim that a certain amount of sprawl is caused by urban land speculation in the market. Tax policies, preferential assessment policies such as greenbelt taxation, and undervaluation of land for property tax assessment purposes stimulate speculation resulting in more land being withheld from development than is efficient. Speculation also invades open spaces near urban areas (Nelson 1990a, 1992a). Speculators tend to acquire rural land farther away from urban development for speculation, land that loses productivity as speculators are unwilling to make or maintain agricultural investments in production for long periods of time (Berry 1978).

1.2.4 Land-Use Regulation

Zoning regulations contribute to sprawl by limiting population densities and separating land uses (Snyder and Bird 1998). Land-use controls that are more restrictive inside urban areas than outside can make rural areas more attractive for developers (Nelson 1990b, 1992b).

1.2.5 Facility Pricing

Most public facilities are priced based on average costs and not on marginal costs (Blewett and Nelson 1988). For example, a city may charge an average cost for water pipeline tap-in (e.g., a fee of $350 per dwelling unit) regardless of the actual locational costs associated with providing the water service. A city that uses a marginal cost pricing approach would have several service zones with variable tap-in fees better reflecting the true costs of providing water services in areas with low pressure problems are perhaps high costs for laying out distribution lines in areas with geologic constraints. Average-cost pricing assesses all development in an urbanizing area equally for infrastructure connections, while marginal cost-pricing strategies assess higher prices that better reflect the true costs of extending services to newly developing low density areas. With average-cost pricing, low- and moderate-income households located closer-in to the City core subsidize households farther out (Nelson and Duncan 1995).

1.2.6 Development Economics

Sprawl makes more economic sense than infill development to the developer. One estimate conducted for the Bay Area in California suggests that the costs of sprawl to the developer are on the order of $100–$132 per square foot, while infill redevelopment costs come in at around $163-$191 per square foot — about 50% more (Bragado, et al. 1995). The savings are associated with lower land, construction, and parking costs for developments in areas outside the urban core.

1.2.7 Demographic Changes

Significant demographic changes have contributed to sprawl, including: population growth, reduced average household size, increased average household income, higher auto ownership, and so on.

1.2.8 Lifestyle Trends

Significant trends in lifestyles and attitudes in recent decades have also contributed to sprawl. These trends include:

- The desire for new housing and commercial space at affordable prices.
- The desire for a larger house and the resulting growth in the average size of new houses.
- The adoption of policies aimed at increasing levels of home ownership.
- Perceptions of higher crime levels and lower school quality in urban than suburban areas.
- The desire to live in smaller jurisdictions in the hope of ensuring better services and more responsive government.
- The desire to live in a homogeneous community historically expressed in racial and ethnic terms but increasingly expressed in terms of income and class.

1.3 POTENTIAL IMPACT OF SPRAWL

What are the effects of sprawl and why is it important to discourage it? Much of the literature on sprawl describes and studies its negative impact. For example, the National Research Council (1974) notes that the benefits of sprawl are distributed regressively with respect to wealth and that sprawl destroys the city core and leads to the proliferation of fragmented and overlapping governmental units. However, research about urban sprawl lists both positive as well as negative impact of sprawl, some of which are listed below.

1.3.1 Negative Impact

Sprawl, by virtue of being a multifaceted problem, is bound to have multiple impact. It is no wonder, then, that the literature provides evidence of different kinds of negative impact of sprawl. While biogeologists claim that sprawling development causes degradation of natural habitats of several species (Calme and Desrochers 2000; Boone and Krohn 2000), sociologists blame sprawl for spreading inequities among people by "socially excluding" residents of inner city neighborhoods (Power 2001), and creating longer distances between jobs, services, shopping, and communities making traveling more expensive, particularly for the disadvantaged

(Horan and Jordan 1995). Economists hold sprawl responsible for loss of valuable agricultural land resulting in artificially lower land values at the periphery (Nelson and Duncan 1995) on one hand, while adding costs on the homeowner in urban cores on the other. Infrastructure costs have been proved to be higher in the case of low-density sprawling development through analyses that suggest that density has a much stronger effect than urban form on public facility costs (Nelson and Duncan 1995). Nelson and Duncan (1995) show that although the greatest savings are at fifteen to thirty units per acre, density at ten units per acre is only 10% more costly than density at fifteen units per acre, but it is nearly a quarter less expensive than five units per acre based on contiguous development patterns. At less than three units per acre, development becomes very costly.

In summary, consequences of sprawling development include hidden costs owing to automobile dependence, higher infrastructure costs, loss of valuable farmland and open space, urban core disinvestments, and traffic congestion. Table 1 categorizes and summarizes the negative impact of sprawl as laid out by Burchell, et al. (1998).

Table 1 Negative Impact of Sprawl

Substantive Concern	Negative Impact
Public-Private Capital and Operating Costs	Higher Infrastructure Costs
	Higher Public Operating Costs
	Higher Private Residential and Non-Residential Development Costs
	Worse Public Fiscal Impact
	Higher Aggregate Land Costs
Transportation and Travel Costs	Greater Vehicle-Miles-Traveled (VMT)
	Longer Travel Times
	Higher Frequency of Automobile Trips
	Higher Household Transportation Expenditure
	Less Cost-Efficient Transit
	Higher Social Costs of Travel
	Higher Risk of Injuries and Fatalities
Land and Natural Habitat Preservation	Loss of Valuable Agricultural Land
	Reduced Farmland Productivity
	Reduced Farmland Viability (Water Constraints)
	Loss of Fragile Environmental Lands
	Loss of Regional Open Space
Quality of Life	Aesthetically Displeasing
	Reduced Community Bonds
	Greater Stress
	Higher Energy Consumption
	Higher Water Consumption
	Greater Environmental Pollution
	Reduced Historic Preservation

Social Issues	Worse Jobs-Housing Imbalance
	Foster Suburban Exclusion
	Foster Spatial Mismatch
	Foster Residential Segregation
	Worsen City Fiscal Stress
	Worsen Inner-City Deterioration

1.3.2 *Positive Impact*

Although a considerable share of the research done on sprawl describes and studies the negative impacts of sprawl, a few studies mention positive impacts as well. Even so, these positive impacts have limited bearing and are largely restricted to suburban residents. For example, Snyder and Bird (1998) consider the promotion of low-density residential lifestyles, easy access to open space at home and in the country, relatively short commuting times, and the ability to separate oneself spatially from problems associated with poverty and the inner city as positive impact of sprawl. Evidently, the above-mentioned impact is borne exclusively by the suburban population. Another study by Downs (1994) mentions benefits such as higher average-lot sizes and housing sizes, less intensive traffic congestion (owing to lower densities), lower crime rates and higher security, and a wider range of lifestyle choices (arising out of fragmentation of local government).

1.4 INDICATORS OF SPRAWL

Researchers have observed sprawl using a variety of different indicators such as density, rate of urbanization, population growth relative to vehicle ownership growth or increase in vehicle miles traveled (VMT). Observations on the extent and rate of sprawl include:

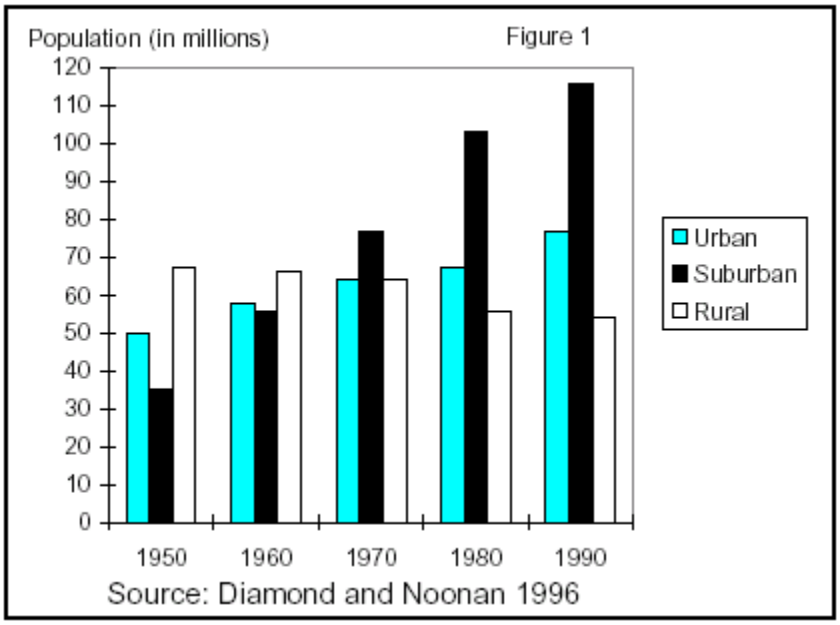

Figure 1 Growth in the Nation's Suburban Population Relative to Urban and Rural Areas since 1950

- From 1970 to 1990, the density of urban population in the United States decreased by 23% (*Statesman Journal* December 18, 1991).
- From 1940 to 1970, the population of the Portland urban region doubled and the amount of land occupied by that population quadrupled (The University of Oregon's Atlas of Oregon 1976).
- Figure 1 illustrates the comparison of suburban population relative to urban and rural populations over the four decades (1950-1990). The comparison shows a huge 267% growth in the nation's suburban population during this period, compared to a moderate 50% rise in the urban population (Diamond and Noonan 1996).
- While the suburban share of the national population increased from 43% in 1980 to 47% in 1990, the central city share declined from 32% to 29% in the same period. Central cities lost 2.5 to 3 million people per year to the suburbs in the 1980-1990 decade (Eno Transportation Foundation Inc. 1996, p. 18).
- From 1970 to 1990, more than 30,000 square miles (19 million acres) of once-rural land in the United States became urban, as classified by the U.S. Census Bureau. That amount

of land equals about one-third of Oregon's total land area (*Statesman Journal* December 18, 1991).

- Although population grew by only 10% and households by 14% between 1980 and 1990, total vehicles owned by households rose by over 17% (Eno Transportation Foundation Inc. 1996, p.32).
- From 1969 to 1989, the population of the United States increased by 22.5 % and the number of miles driven by that population (VMT) increased by 98.4 % (Federal Highway Administration 1989).
- In the 1980s in Oregon, the VMT number increased eight times faster than the population (TRI-MET Strategic Plan 1992).

1.5 MEASURING SPRAWL

Different ways of measuring sprawl may yield widely different results. Thus, it is vital to consider carefully the particular dimension to be employed to measure sprawl. Galster, et al. (2000) have described eight conceptually distinct, objective dimensions of land use that either in isolation or in some combination characterize sprawl and provide measures for these dimensions:

Density may be defined as the average number of residential units per square mile of developable land in an urbanizing area (UA). Developable land is land without natural features, public uses, and regulatory barriers.

Continuity may be defined as the degree to which developable land has been developed at urban densities in a continuous and unbroken fashion. This dimension indicates the extent of leapfrog development. Bodies of water, protected wetlands, forests, parks, slopes or soils, and freeway interchanges are not considered interruptions of continuous development patterns according to Galster, et al. (2000).

Concentration may be defined as the degree to which development is located in a small fraction of the total UA rather than spread out. This dimension distinguishes between those urban areas in which most housing units and employment are located in just a few places at relatively

high densities and those in which development is more evenly distributed across the urban landscape.

Compactness or Clustering may be defined as the degree to which development has been bundled to minimize the amount of land in each square mile of developable land occupied by residential or nonresidential uses. Dense and concentrated development does not ensure clustered development. An UA may have low residential densities, but high clustering if all land uses within a particular area are tightly bunched as is done in cluster subdivisions and planned unit developments.

Centrality may be defined as the degree to which residential or nonresidential development is located close to the central business district (CBD) of an urbanizing area. The centrality of an urban area increases as the average distance from the CBD decreases. An area exhibits greater sprawl where greater distances from the center are required to contain the same proportion of development.

Nuclearity may be defined as the extent to which an urban area is characterized by a mononuclear (as contrasted with a polynuclear) pattern of development. If its CBD is the only location of intense development, an area will have a mononuclear structure and its nuclearity is maximized. If on the other hand, the same activities are dispersed over several intensely developed locations and each contains a good mix of activities that account for a considerable proportion of the total of such activities in the region, it is polynuclear. Nuclearity and concentration may or may not be related. An urbanizing area may have only one nucleus or many nuclei, but if its densities are not significantly greater than the average density of the rest of the UA, concentration will be low.

Diversity may be defined as the degree to which two or more different land uses exist within the same small area and the extent to which this pattern is typical of the entire urbanizing area. As the mixture of uses in a community decreases, travel time and distance of the residents in the area increase. If a UA is characterized by single uses, one would expect an increase in the negative impact of sprawl, such as traffic congestion, trip length, and travel times.

Proximity may be defined as the degree to which different land uses are close to each other across a UA. It is measured by the average distance people must travel from any origin to every other destination. Those UAs where most people must travel great distances have lower proximity between uses and, therefore, can be considered more sprawling. While proximity of the same uses to each other is a significant feature in the agglomeration of related activities in urban space, it seems a less significant feature of sprawl than the proximity of different but complementary uses, such as housing and employment or consumer goods.

1.6 SMART GROWTH AND SPRAWL

It is important to realize that solving or mitigating sprawl is a question about how and where to accommodate growth rather than whether or not to grow. To address this question, several communities throughout the U.S. are turning to a variety of planning strategies that fall under the umbrella of "smart growth." Smart growth has been defined in various ways. The American Planning Association (2002) defines smart growth as "the planning, design, development and revitalization of cities, towns, suburbs and rural areas in order to create and promote social equity, a sense of place and community, and to preserve natural as well as cultural resources." Smart growth was introduced by Congress in 2001 Congress as "policies that recognize the effects of new growth and development, including the environmental, economic, and social costs and attempt to mitigate those effects in advance so as to avoid or reduce them" (Thomas Legislative Information on the Internet 2002). Porter (1999) lays out the five goals of smart growth as follows: (1) preservation of public goods; (2) minimization of adverse land-use interactions and maximization of positive ones; (3) minimization of public fiscal costs; (4) maximization of social equity; and (5), very broadly, maximization of quality of life. The U.S. Environmental Protection Agency demonstrates the ten smart growth principles:

1. Mix land uses
2. Take advantage of compact building design
3. Create a range of housing opportunities and choices
4. Create walkable neighborhoods

5. Foster distinctive, attractive communities with a strong sense of place
6. Preserve open space, farmland, natural beauty, and critical environmental areas
7. Strengthen and direct development toward existing communities
8. Provide a variety of transportation choices
9. Make development decisions predictable, fair, and cost-effective
10. Encourage community and stakeholder collaboration in development decisions

The term "smart growth" thus refers to both a set of general principles or goals that guide planning efforts as well as to the set of policies and practices used to achieve those goals. Smart growth efforts are not solely aimed at slowing or mitigating sprawl, but the problems associated with sprawl are often the prime motivation for smart growth efforts. The chapters that follow draw heavily on the smart growth literature to catalogue strategies and policy actions that communities can use to mitigate urban sprawl.

It should be noted that smart growth strategies can sometimes create unanticipated problems. For example, urban growth boundaries that restrict development in certain areas run the risk of creating artificial shortages of developable land and increasing land prices. Requirements for adequate public facilities may trigger moratoriums when the public funds for infrastructure fall short of needs. The techniques can also impose major planning and administrative requirements on local governments. Growth management programs often call for skilled staff and more time. Connerly (Nelson, et al. 1992c, p. 362) argues that developers usually transfer the costs of impact fees to others and therefore have an exclusionary impact and are inequitable. Snyder and Stegman (1986) estimate that a $5,000 impact fee increases the minimum income required to purchase the home by around $1,600. Because of the persistent differentials in African American and white incomes, housing costs driven up by impact fees will serve as additional barriers to racial integration – a problem that characterized many metropolitan areas (Nelson, et al. 1992c). In addition, market-based strategies that discourage sprawling development and encourage new downtown development may directly reduce the supply of affordable housing by demolition to clear sites for office-tower development. Such strategies may also increase the value of real estate by creating an additional housing demand by new employees attracted to the development (Nelson 1988). Unanticipated problems like these

point to the importance of carefully matching smart growth strategies to the needs and context of the specific community.

CHAPTER 2. TRANSPORATION AND URBAN SPRAWL

2.1 INTRODUCTION

Transportation has two important connections to urban sprawl: transportation investments and policies influence patterns of development, and patterns of development influence patterns of travel. The first connection provides both an explanation for sprawl and a means for its mitigation. Historically, transportation investments have contributed to sprawl, but alternative investments and policies are now considered an important tool for encouraging less-sprawling patterns of development. The second connection contributes both to the costs of sprawl and to the benefits of reducing sprawl. Sprawling patterns of development have contributed to growing levels of automobile travel and its social, environmental, and economic impact, and alternatives to sprawl are promoted as a means of reducing automobile dependence.

Transportation investments and policies influence patterns of development in several ways. In general, new development tends to concentrate where accessibility, as provided by the transportation system, is the greatest and where traffic volumes are highest. The speed of the predominant mode of transportation, whether automobile, transit, or walking, determines the feasible separation between activities and thus the viable density of development. The character of the predominant mode influences the layout and design of individual sites. Historically, investments in the automobile system have contributed to the sprawling, low-density development typical of metropolitan areas in the United States. However, investments in alternatives to the automobile may increase the feasibility of higher-density and infill development.

Second, patterns of development shape patterns of travel in several ways. Where development occurs, density, mix of land use, and site design influence the viability of different modes. In low-density development where there is ample separation between land uses typical of suburban areas in the United States, the automobile is the only efficient option. In higher-density, mixed-use developments, transit and walking are possible and even driving trips may be shorter. Vehicle miles traveled, vehicle hours traveled, and trip frequencies tend to be higher in traditional, conventional neighborhoods with isolated uses and lower densities.

Because travel patterns influence decisions about transportation infrastructure, these connections produce a "self-reinforcing cycle": investments in transportation influence patterns of development, which influence patterns of travel, which then influence transportation investments (Figure 2). Historically, continued investment in the automobile system leads to patterns of development that encourage automobile use, automobile use then encourages continued investment in the automobile system, and so forth. This "vicious cycle" means that each new attempt to solve the problem of allegedly inadequate road capacity has the ultimate effect of exacerbating it (Downs 1992). The cycle is potentially broken through a variety of techniques, in particular, through investments in alternatives to the automobile and by encouraging patterns of development that are supportive of these alternatives.

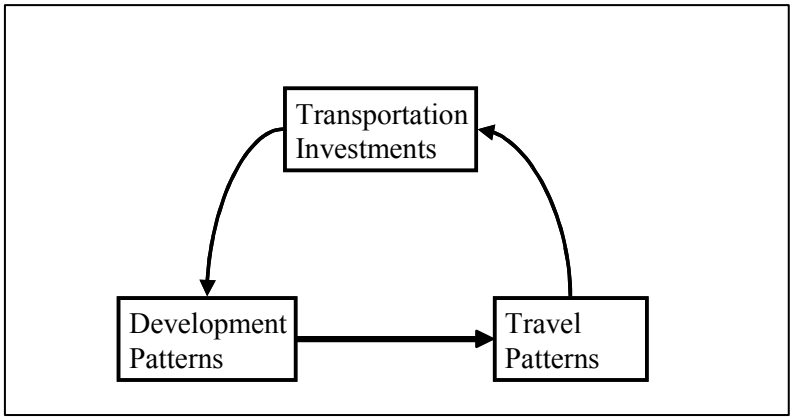

Figure 2 Self-Reinforcing Cycle

2.2 IMPACT OF TRANSPORTATION INVESTMENTS AND POLICIES ON DEVELOPMENT PATTERNS

While the impact of transportation investments on development patterns seems to be weaker today than it was a century ago, particularly in the last three decades, the relationship remains important. Investments in transportation have the potential to significantly affect land-use patterns, urban densities, and housing prices. Transportation investments play a vital role in

directing growth and determining the spatial extent of metropolitan regions by acting in unison with other government policies such as zoning and the provision of other public infrastructure.

There is an extensive literature providing evidence on the historic impact of transportation, the impact of urban freeways, the impact of rail transit, and general relationships between transportation investments and development patterns:

- The streetcar systems and commuter rail of the turn of the 20th century made it possible for the population to spread out from the central city core and live at increasing distances from the workplace (Warner 1962; Fogelson 1993; Mohl 1985; Goldfield and Brownell 1990).
- Decentralization accelerated with the adoption of the automobile and truck in the 1920s and 1930s, and has continued to this day (Muller 1981, 1995; Lowry 1988).
- Access to highways is one of the most important factors determining the location of firms (Lyne 1988; Button, et al. 1995; Calzonetti and Walker 1991).
- The interchanges of these high-speed highways have given some suburban locations the level of accessibility that previously only occurred in central business districts (Muller 1995; Leinberger 1996; Hughes and Sternlieb 1988).
- In regions with extensive networks, such as Atlanta, GA; Columbus, OH; and Kansas City, MO, the interstate highways have been one of many factors supporting the geographic spread of the region and the development of suburban activity centers at the nodes of interstate networks (TRB 1999). Businesses will outbid households for locations along arterials and highways and especially at the nodes in the transportation system (Downs 1992).
- Beltways may merely redistribute development, shifting growth from the central business district to the suburbs and thus contributing to the decentralization of cities (Payne-Maxie Consultants 1980).
- There is a strong positive correlation between highway accessibility and land prices, after controlling for a wide variety of other variables, including parcel size and square footage of development (Kockelman 1997).
- In regions where transit systems are well developed and integrated into the pattern of development, residential property values were higher near rail transit. In regions where

rail transit provides less of an accessibility advantage, home prices are unaffected by proximity to rail stations (Landis, et al. 1995).

- Proximity to light rail transit improves residents' accessibility to the central business district and other urban areas with employment opportunities (Al-Mosaind, et al. 1995).
- The interactions of households, businesses, developers, and government determine the physical arrangements of land uses in urban areas (TRB 1999).
- The supply of developable land is constrained by the public and private resources available to extend roads and other infrastructure systems such as water, sewer, storm water, and transportation systems (Kelly 1993; Nelson and Duncan 1995; Miles, et al. 1996).
- Typically, many of these attributes such as the supply of developable land, lower costs of development or leasing, access to labor, and good access to highways are more readily available on the urban fringe than in already developed areas (White, Binkley, and Osterman 1993).
- Major improvements to existing transportation infrastructure should have a strong, positive effect on nearby real estate values. However, the impact may be highly localized and of a much lesser degree than that caused by the original construction (Landis, et al. 1995; Tomasik 1987).
- Park space and retail-jobs accessibility exert positive effects on home valuation and location choice (Srour, Kockelman, and Dunn 2001).

Transportation investments and policies may be divided into four general categories: highway and automobile-related investments (e.g., new facilities and construction, and added lanes), travel demand management (e.g., pricing policies and taxations), transit investments and policies (e.g., new transit facilities and service and fare changes), and nonmotorized mode facility investments and policies (e.g., bike/pathway improvement). The impact of these types of investments and policies is summarized in Table 2. The impact may include shifts of population and jobs toward more-accessible locations such as downtown areas, stations, and major transit corridors, increase in land values, and concentration of development (National Cooperative Highway Research Program 1999). In their study of the Bay Area Rapid Transit (BART) system, Cervero and Landis (1997) found significant increases in population and employment

densities, multifamily housing, and retail and commercial establishments around BART stations. Undesirable impact of transportation investments and policies may include decentralization of population and employment to suburban or exurban areas that imposes a variety of costs, including increased economic costs to construct roadway facilities, increased land requirements for roads, environmental and aesthetic cost from reduced greenspace, and so on (Badoe and Miller 2000; Litman 1999). Even though Giuliano (1995) indicates that transportation investments do not have a consistent or predictable impact on land use, she states transportation investments are viewed as critical to growth-management policy objectives.

Table 2 Impact of Transportation Investments and Policies on Development Patterns

Category	Investment and/or Policy	Impact
Highway and Automobile-Related Investments and Policies	New facilities and construction	Redistribution of metropolitan growth to highway corridors
	Added lanes and intersections	Decentralization of population and employment
	Automobile-Supportive ITS	Increased land values around interchanges, nodes, and/or terminals
	System management	Concentration of development around interchanges, nodes, and/or terminals
Travel Demand Management (Automobile-Related)	Congestion Pricing	New towns
	Parking pricing and management	Shift of population and jobs toward more accessible locations
	Vehicle and fuel tax	Shift of population and employment to exurban areas
Transit Investments and Policies	New facilities	Increased development of major employment centers
	Transit line extensions	More compact development
	Added stations	Increased development density
	New high capacity transit lines	Redistribution of development to downtown and station areas
	Changes in local service	Redistribution of development to major (bus) transit corridors
	Fare policy changes	
Non-motorized Related Investments and Policies	New facilities	
	Safety Improvements	

Source: Land Use Impacts of Transportation: A Guidebook (1999)

2.3 IMPACT OF DEVELOPMENT PATTERNS ON TRAVEL PATTERNS

Many previous studies have focused on analyzing the connection between land-use patterns and travel behavior. Travel behavior studies may be categorized as either studies of mode choice or of other travel characteristics such as trip frequency and length of trips. An extensive body of research on this topic generally supports the assumption that sprawling

patterns of development characterized by low densities and automobile-oriented design are associated with more driving, although some studies point to important complexities in understanding these relationships. Some of the key findings are provided below.

2.3.1 Relationship between Land-Use Patterns and Travel Characteristics

- Trip frequency is lower in traditional communities (typical, conventional neighborhoods) and higher than average in planned unit developments (San Diego Association of Governments 1993).
- Trip times are shorter than average in the traditional city and longer than average in large-lot sprawl (Ewing, et al. 1994).
- Trips are shorter in mixed-use neighborhoods; person-miles-traveled is lower in mixed-use neighborhoods (McCormack, et al. 2001).
- Average vehicle occupancy is higher in mixed-use development areas (Cervero 1991).
- Shopping trips are shorter at locations with high local or regional accessibility (Handy 1993).
- Person-miles-traveled for shopping is lower at locations with local or regional accessibility (Handy 1993).
- Vehicle hours traveled is lower at more regionally accessible locations (Ewing 1995).
- Work trips are shorter where commercial uses are nearby (Cervero 1996).
- Vehicle miles traveled (VMT) is lower at higher densities (Dunphy and Fisher 1996).
- Vehicle trips are less frequent at higher densities (Dunphy and Fisher 1996).
- VMT for nonwork trips is lower where the intensity factor or amount of vertical mixing is greater (Cervero and Kockelman 1997).
- Trips are shorter at locations of higher population and residential density (Ross and Dunning 1997).
- Nonwork auto-trip frequency is lower in locations with higher retail employment densities (Boarnet and Greenwald 2000).

2.3.2 Relationship between Land-Use Patterns and Travel Mode Choice

- Walk and bike shares are higher in traditional communities (San Diego Association of Governments 1993).

- Transit share is lower in traditional communities (San Diego Association of Governments 1993).
- Frequency of transit trips is higher in traditional neighborhoods (Kulkarni, et al. 1995).
- Frequency of walk/bike trips is lower in planned-unit developments (Kulkarni, et al. 1995).
- Modes other than auto are more likely to be used for nonwork trips in traditional neighborhoods (Cervero and Radisch 1996).
- Walk shares are higher in mixed-use neighborhoods (McCormack, et al. 2001).
- Transit share of commute trips is higher for the urban and suburban downtowns (Douglas and Evans 1997).
- Transit trip rates rise with densities; transit trips are more frequent at higher densities (Spillar and Rutherford 1990).
- Rail transit commute share is greater for higher-density residential settings (Cervero 1994).
- Higher densities induce more walk access trips to rail (Cervero 1994).
- Use of transit and walk/bike is more likely where commercial uses are nearby (Cervero 1996).
- Rail ridership is higher at higher densities (Parsons, Brinckerhoff, Quade, and Douglas 1996).
- Land-use mix at work sites boosts transit ridership by 120% (Pushkarev and Zupan 1977).
- Aesthetic urban settings have the greatest influence on transit mode choice (Cambridge Systematics Inc. 1994).
- Use of modes other than autos is more likely in neighborhoods with more intense development (Cervero and Kockelman 1997).
- A combination of land-use mix and compact urban design can reduce automobile trips by 7% after controlling for density and income (1000 Friends of Oregon 1995).
- Use of walk/bike is more likely at locations of higher regional accessibility or a more balanced mix of land uses (Kockelman 1997).
- Walk mode shares are greater at higher-population and residential densities (Ross and Dunning 1997).

- Transit mode shares are greatest at the highest population and residential densities (Ross and Dunning 1997).
- Transit ridership is higher in areas of high employment density (Buch and Hickman 1999).

CHAPTER 3. STATE DEPARTMENTS OF TRANSPORTATION AND GROWTH MANAGEMENT

3.1 INTRODUCTION

State Departments of Transportation (state DOTs) traditionally have focused on responding to metropolitan growth and have given little thought to the role of transportation investments and policies in efforts to manage metropolitan growth. However, an increasing recognition of the importance of this role has pushed a growing number of state DOTs to actively participate in growth-management efforts. Although the level of participation varies widely, several state DOTs have made growth management an essential component of their approach to transportation planning. These efforts span across the initial stages of establishing goals and strategies, implementation, and evaluation and monitoring. Not surprisingly, the most active state DOTs are found in states with statewide growth-management mandates, such as Maryland, Oregon, and Washington. Other state DOTs focus on coordinated efforts with local governments rather than statewide comprehensive efforts. The pattern of growth-management reform in state DOTs tends to follow the general planning pattern of growth-management reform, as mapped by the American Planning Association (2002) shown in Figure 3.

The smart growth goals of the most active state DOTs can be summarized as follows:

1. Ensure mobility (build and maintain transportation systems and mitigate traffic congestion) to support existing and planned growth areas.
2. Support access to existing and planned land uses to greater multimodal transportation choices (public transportation and nonmotorized transportation facilities).
3. Emphasize environmental stewardship (open-space preservation and air quality) in any transportation planning stage.
4. Emphasize urban issues related to quality of life through transportation investments and policies (safety, old town revitalization, ensuring benefits to underserved groups, livability of communities).
5. Strengthen state-local partnership relationship in transportation and land-use planning process.

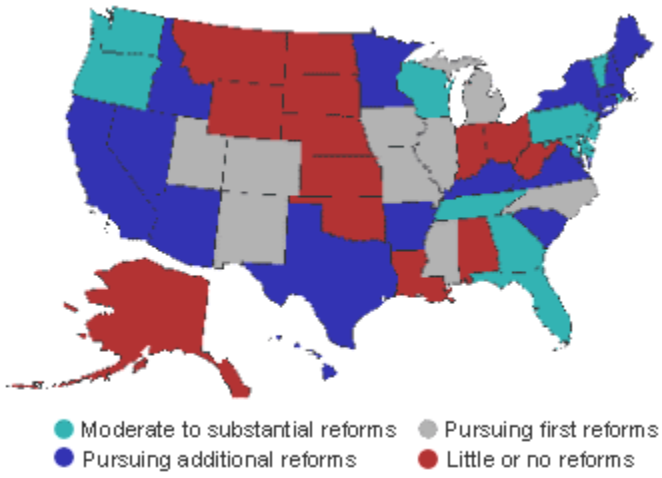

Figure 3 States and Planning Reforms

3.2 SURVEY OF STATE DOTS

To explore the efforts of state DOTs in managing urban growth, transportation professionals in transportation planning divisions within 49 state DOTs were surveyed by email questionnaires. They were asked to provide details of any sprawl mitigation or growth-management efforts that are underway or in place, administered, or led by their agencies. The first survey was conducted between November 27, 2001 and December 27, 2001. The participants were given opportunities to revise or update their information in the second survey which was six months after the first survey and was conducted between June 9, 2002 and July 9, 2002. Out of the 49 state DOTs surveyed, 39 state DOTs responded and provided valuable information, including comprehensive packets and attached Word documents as well as email responses. The respondents are listed in Table 3. The list of efforts identified through this survey is not necessarily comprehensive, but it is indicative of the kinds of efforts undertaken by state DOTs.

Overall, the efforts of state DOTs in growth management may be described as "in-progress," at best, because there is little assessment or evaluation of their efforts. Because the authority for comprehensive planning, zoning, and subdivision is mostly vested in local governments, state DOTs tend to have no explicit, direct ability to manage growth. Rather, they

may pay more attention supporting and coordinating their efforts with local land-use planning. The efforts currently administered by state DOTs fall into several different categories:

1. Statewide Transportation Plans to Manage Growth

Goals, strategies, and approaches in short- or long-term transportation plans, such as the statewide transportation plan, emphasize the importance of the link between transportation investments and policies and urban growth or development patterns. For example, Maryland DOT's 2002 Maryland Transportation Plan favors transportation investments that support smart growth.

Table 3 Contact List of State Departments of Transportation

No	State	State DOTs	Contac	Name	Position	Email
1	Alabama	Alabama Department of Transportation	YES	George T. Ray	Bureau Chief, Transportation Planning Bureau	rayg@dot.state.al.us
2	Alaska	Alaska Department of Transportation and Public Facilities	YES	Marti Dilley	Manager, Statewide Tran. Plan., Div. of Statewide Planning	Marti_Dilley@dot.state.ak.us
3	Arizona	Arizona Department of Transportation	YES	John Pein	ADOT Training and Planning Div.	jpein@dot.state.az.us
4	Arkansas	Arkansas State Highway and Transportation Department	YES	Virginia H. Porta	Policy Analysis Section Head, Planning and Research Division	Virginia.Porta@ahtd.state.ar.us
5	California	California Department of Transportation	YES	Debbie Bell	Office of Community Planning	Debbie_Bell@dot.ca.gov
6	Colorado	Colorado Department of Transportation	YES	Jamie Collins	Public Involvement program for Statewide Planning	jamie.d.collins@dot.state.co.us
7	Connecticut	Connecticut Department of Transportation	YES	Nancy C. Laraia	Admin. Assit., Bureau of Policy and Planning	Nancy.Laraia@po.state.ct.us
8	Delaware	Delaware Department of Transportation	NO	-	-	-
9	Florida	Florida Department of Transportation	YES	Dale Eacker	Land Use & Trans. Planning Program, Dept. of Community Affairs	dale.eacker@dca.state.fl.us
10	Georgia	Georgia Department of Transportation	YES	Marta Rosen	State Transportation Planning Administrator	marta.rosen@dot.state.ga.us
11	Hawaii	The State of Hawaii Department of Transportation	YES	Elton Teshima	Statewide Trans. Plan.	Elton_Teshima@exec.state.hi.us
12	Idaho	Idaho Transportation Department	YES	Patti Raino	Intermodal Planning Manager, Div. Of Planning	PRaino@itd.state.id.us
13	Illinois	Illinois Department of Transportation	YES	Susan Stitt	-	STITTSB@nt.dot.state.il.us
14	Indiana	Indiana Department of Transportation	YES	Steve	-	SSMITH@indot.state.in.us
15	Iowa	Iowa Department of Transportation	YES	Stan Paterson	-	stanpeterson6@yahoo.com
16	Kansas	Kansas Department of Transportation	YES	Terry W. Heidner	Director of Planning and Development Division	terry@ksdot.org
17	Kentucky	Kentucky Transportation Cabinet	YES	Charles Schaub	Kentucky Trans. Cabinet, Division of Multimodal Programs	Charles.Schaub@mail.state.ky.us
18	Louisiana	Louisiana Department of Transportation and Development	YES	Eric Kalivoda	Deputy Assi. Secretary, Office of Planning and Programming	EricKalivoda@dotd.state.la.us
19	Maine	Maine Department of Transportation	YES	Kathy Fuller	Assistant Director of Planning	Kathy.Fuller@state.me.us
20	Maryland	Maryland State Highway Administration	YES	Bruce M. Grey	Deputy Project Division Chief, MSHA	BGrey@sha.state.md.us
21	Massachusetts	Executive Office of Transportation and Construction	NO	-	-	-
22	Michigan	Michigan Department of Transportation	NO	-	-	-
23	Minnesota	Minnesota Department of Transportation	YES	Margie Grilley	Reference Librarian, Mn/DOT	margie.grilley@dot.state.mn.us
24	Mississippi	Mississippi Department of Transportation	NO	-	-	-
25	Missouri	Missouri Department of Transportation	YES	Marcie K. Meystrik	Transportation Planning Coordinator	MEYSTM@mail.modot.state.mo.us
26	Montana	Montana Department of Transportation	NO	-	-	-
27	Nebraska	Nebraska Department of Roads	YES	Ken Sieckmeyer	Manager, Division of Transportation Planning	ksieckme@dor.state.ne.us
28	Nevada	Nevada Department of Transportation	NO	-	-	-
29	New Hampshire	New Hampshire Department of Transportation	NO	-	-	-
30	New Jersey	New Jersey Department of Transportation	YES	William S. Beetle	Director, Division of Transortation Systems Planning	(609) 530-3874
31	New Mexico	New Mexico Highway and Transportation Department	YES	Patericia Oliver-Wright	Planning Dept.	Patricia.Oliver-Wright@nmshtd.state.nm.us
32	New York	New York Department of Transportation	NO	-	-	-
33	North Carolina	North Carolina Department of Transportation	`	Harrison Marshall	Tran. Planner III, Statewide Planning Branch	hmarshall@dot.state.nc.us
34	North Dakota	North Dakota Department of Transportation	YES	Darcy Rosendahl	P.E., Planning and Programming Division	DRosenda@state.nd.us
35	Ohio	Ohio Department of Transportation	YES	Matt Selhorst	Deputy Director, Division of Planning	mselhors@dot.state.oh.us
36	Oklahoma	Oklahoma Department of Transportation	YES	-	-	sshehab@FD9NS01.OKLADOT.STATE.OK.US
37	Oregon	Oregon Department of Transportation	YES	Barbara Fraser	Co-Manager, Transportation and Growth Management	Barbara.K.Fraser@odot.state.or.us
38	Pennsylvania	Pennsylvania Department of Transportation	YES	Angela Watson	Sound Land Use Coordinator, Office of Planning	awatson@dot.state.pa.us
39	Rhode Island	Rhode Island Department of Transportation	YES	Robert Shawver	Policy and Planning Division	rshawver@dot.state.ri.us
40	South Carolina	South Carolina Department of Transportation	YES	Mark D. Pleasant	Office of Planning	PleasantMD@dot.state.sc.us
41	South Dakota	South Dakota Department of Transportation	YES	Laurel G. Selken	Office of Planning and Programs	Laurel.Selken@state.sd.us
42	Tennessee	Tennessee Department of Transportation	YES	John R Tidwell	Director of the Program Development and Administration Division	jtidwell@mail.state.tn.us
43	Texas	Texas Department of Transportation	-	-	-	-
44	Utah	Utah Department of Transportation	NO	-	-	-
45	Vermont	Vermont Agency of Transportation	NO	-	-	-
46	Virginia	Virginia Department of Transportation	YES	R. Ben Mannel	Transportation Engineer Senior	Ben.Mannell@VirginiaDOT.org
47	Washington	Washington Department of Transportation	YES	Julio Diaz	Transportation Planning Specialist, Planning Office	DiazJ@WSDOT.WA.GOV
48	West Virginia	West Virginia Department of Transportation	YES	John Lancaster	Head of Planning Division	jlancaster@dot.state.wv.us
49	Wisconsin	Wisconsin Department of Transportation	YES	Kassandra Walbrun	State and Local Policy Section, Office of Policy and Budget	kassandra.walbrun@dot.state.wi.us
50	Wyoming	Wyoming Department of Transportation	YES	Jay Meyer	-	Jay.Meyer@dot.state.wy.us

2. New or Revised Initiatives

Several state DOTs have adopted initiatives that encourage growth-management efforts on the part of local communities. California DOT (Caltrans) has an on-going Sustainable Communities Initiative. Pennsylvania DOT (PENNDOT) has a Transportation Project/Land Use Planning Initiative that will provide $1.8 million over the next 3 fiscal years through planning partners to conduct sound land-use planning in conjunction with major transportation investments. Colorado DOT established the Short Grass Prairie Initiative through an inter-agency agreement in order to work with resource conservation organizations to manage prairie habitat in eastern Colorado.

3. Legislation Requirements

Imposing legislation is the most powerful and direct way of ensuring some role for the state DOT in growth-management efforts. For example, Virginia DOT is proposing a bill in the Virginia General Assembly that demands a transportation element in each region's comprehensive land-use plans and requires that the transportation element be developed in consultation with the Virginia DOT. Similarly, statutes in North Carolina require that an adopted land development plan be in place before a transportation plan may be initiated. In the state of Washington, several transportation-related sections (including Priority Programming for Highways, Statewide Transportation Planning, and Regional Transportation Planning Organizations) of the Growth Management Act (GMA) have been enhanced to include land use, and the requirements of the amended legislation are being applied to the transportation element (under the guidance of Washington DOT) of a locally adopted comprehensive plan. In Maine, large developments require permits from the state DOT.

4. New Administrative Offices, Commissions, Councils, or Strategies Team

A variety of organizational changes have been implemented to facilitate growth-management efforts. Caltrans created an Office of Community Planning to address the statewide need for community-sensitive approaches to transportation decision making. Illinois DOT created and funded several Corridor Planning Councils as multijurisdictional-planning efforts in major transportation corridors. The Maryland Transit Administration (MTA) under the Maryland DOT includes an Office of Transit-Oriented Development. PENNDOT established a Sound

Land Use Strategies Team in May 1999 to develop strategies for incorporating land use into the department's transportation investments and policies.

5. New Joint Programs and Multiagency Cooperation

Another approach is to establish joint programs between state agencies and other organizations. Oregon DOT has a joint program, Transportation and Growth Management (TGM), with the Oregon Department of Land Use and Development. The joint program provides grants, development design consulting, code assistance, and outreach to support the local planning required to link the issues of transportation and growth management. In Florida, the state DOT and the Land Use and Transportation Division of the Florida Department of Community Affairs work in collaboration to provide training and technical assistance to local governments regarding transportation planning and concurrency management systems. Similarly, the Indiana DOT works with the Indiana Land Resources Council, and Missouri DOT is participating in the Missouri Commission on Intergovernmental Cooperation, which has both a Community Growth and Revitalization Committee as well as a Transportation Access Management Committee.

Proposals by the Illinois DOT are presented before the Illinois Growth Task Force, and the department participates in purchasing open spaces along with the Department of Natural Resources. Illinois DOT is also implementing Transportation Balanced Growth Partnership involving the Illinois Environmental Protection Agency, Northeastern Illinois Planning Commission, the Chicago Area Transportation Study, the Metropolitan Planning Council, and so on. New Jersey DOT (NJ DOT) participates as one of the seventeen members of the State Planning Commission established by the New Jersey State Legislature to create and implement New Jersey's State Development and Redevelopment Plan. Rhode Island DOT (RIDOT) is participating with other state agencies in the state's Growth Planning Council. The Transportation Planning Division in the Virginia DOT has worked with the Virginia Transportation Research Councils to study the methods for coordinating land use and transportation-planning functions.

6. Grants, Loans, or Funding Allocations

Funding provides an important tool for state DOTs to promote growth-management efforts. Caltrans awards grants for projects that promote use of existing infrastructure and implement principles that the Federal Highway Administration supports. Colorado DOT established the Environmental Revolving Fund, an internal, departmental loan fund for eco-friendly projects. The Tennessee DOT has a policy that those counties and municipalities that do not have approved growth-management plans shall not be eligible for loans or grants from any subsequent federal authorization for transportation funds. RIDOT's Transportation Improvement Program (TIP) allocates the vast majority of available funding to transportation system management and preservation projects and funds few system expansion projects.

7. Staff Training and Hiring Land-Use Planners/Coordinators

Several DOTs have recognized the importance of training and hiring staff to focus on growth-management efforts. PENNDOT recognizes that a critical first step in coordinated transportation and land-use practices is inextricably linked to informing, educating, and sensitizing its staff on land use. Wisconsin DOT (WisDOT) also recognizes that the staff's understanding of the transportation land-use relationship should be enhanced. The Transportation Planning Division in the Virginia DOT has provided in-house training and has sought to hire individuals with urban and regional planning experience.

8. Outreach (Workshops and Developing Guidelines)

Outreach is a crucial component of most programs. In Oregon, the TGM Outreach program is aimed at increasing the understanding and acceptance of smart development principles through community workshops, partnership programs, and technical assistance to local community practitioners. Several state DOTs are developing guidelines for local governments for a specific purpose as well as land-use efficient transportation planning. For example, Caltrans develops practical guidelines and approaches for implementing environmental justice in local planning.

9. Technology and Resource Support

Providing technical and resource support is another way state DOTs can promote growth-management efforts. For example, a state DOT might provide a clearinghouse for digitized maps

and geodatabases of the transportation and land-use inventory. Technical support in the area of integrated transportation land-use modeling may become increasingly important. For example, PENNDOT supports computer simulation technology for predicting the transportation and land-use interface of various development scenarios.

10. Evaluation or Assessment Tools

It is also important for state DOTs to evaluate and assess growth management efforts. In 2000, the Maryland Legislature approved legislation requiring Maryland DOT to adopt performance measures that support evaluation of its success in meeting the goals laid out in the Maryland Transportation Plan. Illinois DOT will develop a toolbox for local officials that will help them evaluate various balanced growth strategies.

Table 3.1 summarizes the growth-management efforts of state DOTs. The first set of strategies or policy actions consists of those that have been implemented in many states.

Table 3.1 Sprawl Mitigation Efforts of State Departments of Transportation

State DOTs	Strategies or Policy Actions	Description
-	Highway Project Selection Process (Permitting)	See Appendix B-1
	Transit-Oriented Development (TOD)	
	Fix-It-First Transportation Reinvestment	
	Transportation Enhancement Program	
	Corridor Preservation	
	Multi-modal Transportation Investments	
	Access Management	
	Traffic Impact Analysis	
	Transportation Demand Management	
California	Office of Community Planning (OCP)	Created OCP for community-sensitive approaches to transportation decision-making.
	Sustainable Communities Initiative	Provides support for planning and capital projects that invest in smart growth strategies.
	Environmental Justice Grants	Develop guidelines and approaches for implementing environmental justice in local planning.
Colorado	Early Corridor Environmental Analysis	Corridor optimization with an explicit focus on environmental impacts
	Endangered Species/Habitat Mitigation Banking	Available habitat areas are deposited into the bank.
	Environment Revolving Fund	An internal CDOT loan fund for environmental mitigation purposes
	Short Grass Prairie Initiative	Inter-agency agreement to work with conservation organizations and the agricultural community
Illinois	Corridor Planning Councils	Multi-jurisdictional planning efforts in major transportation corridors
	Transportation Balanced Growth Partnership	Will yield a model for an intergovernmental planning process
Maryland	Transit Station Area Development Incentive Program	Provide funds that can stimulate private investment in the adjacent transit station areas
	Adopt-a-Shelter/Station Program	Provides resources to community groups to landscape and care for transit stops
	Community Planting on State Highways	Provides design assistance and plant materials at key locations
	Quality Community Surveys	Community visioning exercise to promote understanding and to direct plans and designs
	Commute Smart Program	Implementing telework, regional commuter assistance and clean vehicle technologies etc
	Access Management Team	Representatives from planning, real estate, traffic and safety, engineering access permits and counsel
	Land Use Experts Panel	Formation of a panel of outside professionals
	Performance Measurement	Performance measures that support evaluation of MDOT's success in meeting the goals
Minnesota	Interregional Corridor Connections	Improve and protect important highway connections between Minnesota's regional trade centers
New Jersey	Transit Village Initiative	Funding and technical assistance from ten state agencies led by NJDOT and NJ TRANSIT
North Carolina	Rural Planning Organizations (RPOs)	Adopted the NCDOT proposal to create RPOs
Oregon	Transportation and Growth Management (TGM)	Joint program with the Oregon Department of Land Use and Development
	TGM: Grants	Help local communities plan that creates livable, transportation-efficient communities.
	TGM: Quick Response Team	Helps a community or developer meet smart development design objectives.
	TGM: Code Assistance	Provided to local governments to prepare or amend development codes
	TGM: Outreach Program	Workshops, a partnership program and technical assistance for practitioners
Pennsylvania	Sound Land Use Strategies Team	Develop a strategy for incorporating land use into the Department's programs, policies and activities
	Sound Land Use Implementation Plan	PENNDOT's framework for its sound land use policy
	Land Use Coordinator	New full-time position established in the Department's Center for Program and Development and Management
	Growing Smarter Conference	Supports Growing Smarter Conference with both staff and financial services
	Greenways Partnership Program	With the Dept. of Conservation and Natural Resources, aimed at promoting sound land use and preserving open space
Virginia	Rural Transportation Planning Program	Rural transportation planning assistance program and the rural grant program

The remainder of the table lists the more specific practices of certain state DOTs, as described below:

1. Highway Project Selection Process (Permitting) to Enhance Sprawl Mitigation

In Louisiana, the highway project selection process includes a provision in the ranking of capacity expansion projects to reward local jurisdictions that have and enforce a growth-management policy or plan that meets minimum state requirements. In Maine, redevelopment or reuse of existing abandoned urban developments is exempt from getting a Traffic Movement Permit as a measure to encourage greater urban densities. In Ohio, the selection among capacity expansion projects operates under the purview of the Transportation Review Advisory Council, a permanent body of predominantly non-Ohio DOT personnel. The scoring process for project selection gives additional points to urban revitalization projects.

2. Transit-Oriented Development (TOD)

Maryland DOT has its own TOD incentive as a part of the Transit Station Smart Growth Program and has developed strategies for dedication of Maryland DOT-owned real estate in support of TOD. The Office of TOD in the MTA administers the Neighborhood Conservation Program, the Transportation Enhancement Program, Access 2000, the Transit Station Area Development Incentive Program, and provides other funds to support streetscape improvements in TOD areas and to financially assist TOD projects by local governments. NJ DOT administers the Pilot Transit Villages Initiative. Pilot Transit Villages are compact, mixed-use developments, in which residences are a quarter-to-half-mile walk from a passenger transportation facility. These villages have been provided funding and technical assistance from ten New Jersey state agencies led by the DOT and New Jersey Transit (NJ Transit).

3. Fix-It-First Transportation Reinvestment

Illinois DOT administers its transportation improvement program to focus on repair, rehabilitation and maintenance of its existing transportation system to preserve and update the existing highways and to modernize, rehabilitate and replace aging capital assets. Maryland DOT works with local governments and the Department of Housing and Community Development to identify eligible transportation projects to help to implement local revitalization plans (Neighborhood Conservation Program).

4. Corridor Planning

Colorado DOT administers a Corridor Optimization Program to study specific corridors for transportation alternatives. The Kentucky Transportation Cabinet has developed a tool to help guide a comprehensive planning process for roadway corridors ("Bluegrass Corridor Management Planning Handbook"). Illinois Tomorrow Corridor Planning Grant Program has been designed to help local governments develop land-use and infrastructure plans in major transportation corridors. PENNDOT has a Greenways Partnership Program and Congestion Management Corridors. RIDOT has initiated a Corridor Planning Process that will fully assess the relationship of land use and transportation within the studied corridors. WisDOT also has a statewide Corridor Planning Program.

5. Multimodal Transportation Investments

Illinois DOT's FIRST infrastructure program has provided a significant increase in capital funding for public transportation in Illinois. Maryland DOT's Access 2000 program improves both pedestrian and bicycle access to transit rail stations. Through its Sidewalk Retrofit Program, the Maryland SHA pays up to 100% of the cost of sidewalks in locally designated revitalization areas.

6. Access Management

Indiana DOT and WisDOT are developing a statewide access management policy to support land-use planning and actions as well as to manage safety and traffic congestion. Maine DOT's access management rule requires a permit to access state or state-aid highways, and new alignment projects are built as access control highways. While achieving safe traffic operations and flow along existing highways, Maryland DOT's Access Management Plans support corridor preservation efforts by balancing the provision of access to accommodate land-use development.

7. Traffic Impact Analysis

PENNDOT and WisDOT are implementing a policy on traffic impact analyses for proposed developments. In particular, PENNDOT is considering the development of an assessment tool for considering the secondary and cumulative effects of transportation improvements.

8. Transportation Demand Management

Administered by many state DOTs, various pricing approaches, work-based strategies, and parking supply management have been applied (see Appendix A for descriptions of state-of-art techniques of transportation demand management).

3.3 CONCLUSIONS

Ms. Kathy Fuller, assistant director of planning of Maine DOT, provides an insightful definition of the role of the state DOTs in growth management and sprawl mitigation efforts:

The subject of [sprawl mitigation] is an issue the Maine Department of Transportation is struggling with. Several policies of the department have been identified as contributing to sprawl. Because Maine DOT is the owner or manager of the transportation asset, it has a responsibility to educate communities who have land-use authority in Maine. It is our responsibility to teach them about the various functions of the system and how they have a responsibility as taxpayers and system users to help us take care of the resource and the investment.

Overall, state DOT-administered efforts to mitigate sprawl are on the rise. However, several challenges must be addressed in order to achieve effective implementation. First, because state DOTs have limited power to influence local land-use planning, how they support and coordinate with local land-use planning agencies is critical. Second, many efforts are still quite preliminary and tentative, and the long-term benefits of innovative techniques are as yet uncertain. Third, budgets may constrain sprawl mitigation efforts on the part of the state DOT. As the North Carolina DOT indicates, the current budget situation has not allowed the department to retain additional staff to provide assistance for sprawl mitigation.

CHAPTER 4. THE SPRAWL MITIGATION MATRIX

4.1 INTRODUCTION

The spectrum of sprawl mitigation policies ranges from information or education to financial assistance to capital investments to disincentives to regulation. Based on an extensive review of existing literature and practices followed by an expert panel review, we developed a comprehensive list of strategies and policy actions that may mitigate sprawl. "Strategies" are defined here as relatively broad categories of policies directed towards a common purpose or reflecting a common approach. "Policy actions" are the more specific steps that agencies would implement as a part of a sprawl-mitigating effort. We have broadly classified all strategies as either transportation-related or growth-management strategies.

In general, transportation-related strategies involve investments in transportation infrastructure or policies about transportation. In this category, we include land-use policies designed to reduce the demand for driving, or "transportation-efficient land-use policies." Growth-management strategies include traditional and innovative approaches to influencing the location and character of development. Tables 5 and 6 list the transportation-related and growth-management-related strategies and policy actions respectively. Appendices B-1 and B-2 describe the transportation-related and growth-management-related policy actions, respectively, along with relevant examples and references.

The sprawl mitigation matrix consists of eight separate matrices that catalogue both transportation-related and growth-management policies according to their goals (Matrices C-1A and C-1B); characteristics (Matrices C-2A and C-2B); suitability for different kinds of communities (Matrices C-3A and C-3B); and effectiveness of strategies and policy actions based on the expert panel review and a literature review (Matrices C-4A and C-4B). Based on an extensive literature review on the topics of growth management, sprawl mitigation, and smart growth, the preliminary matrices were developed. These matrices were then sent to a panel of experts in the fields of transportation and land use. Nine panelists provided comments on the list of policy actions, goals, characteristics, and suitability factors. Seven panelists responded to a second-round request to rate the transportation and growth management strategies according to their overall effectiveness in advancing transportation and growth-management goals. The

feedback of the panel was incorporated into the final versions of the matrices, presented in Appendix C. The literature and expert panel reviews are described in greater detail in the next two subsections.

Table 4 Transportation-Related Strategies and Policy Actions

Strategy		Policy Action
Transportation-Efficient Land Use Planning and Development Strategies		Rail-Based Transit-Oriented Development (TOD) Bus-Based Transit-Oriented Development (TOD) Traditional Neighborhood Development (TND) Main Street Program (Downtown Revitalization) Neighborhood Conservation Program Jobs-Housing Balance Programs Corridor Preservation and Planning Access Management Program Parking Supply Management: Flexible Requirements Parking Restrictions: Area-wide Parking Caps
Pricing Strategies	Automobiles / Roadways	Parking Demand Management Gasoline Tax Increase Road Pricing: Toll Roads Congestion Pricing: High Occupancy Toll (HOT) Lanes Congestion Pricing: Area-Wide or Cordon Pricing Congestion Pricing by Automatic Vehicle Identification (AVI) Distance-Based Taxes
	Transit	Transit Fare Adjustment
Alternative Mode Support Strategies	Facility and Systems Improvements	Traffic Calming Alternative Roadway Design Standards High Occupancy Vehicle (HOV) Facilities Bus Transit Service Improvement Custom Transit Services Non-Motorized Mode Facility Support Park & Ride Lots Transportation Enhancements Program Carsharing and Ridematching Services Vanpooling and Ridematching Services Information Technology Applications for Transit and Ridesharing Modes
	Capital Investments	Light Rail Transit (LRT) Investments Bus Rapid Transit (BRT) Investments Commuter/Heavy Rail Transit Investments
	Public Education	Public Education and Promotion for Alternative Modes
Worksite-Based Strategies		Monetary Incentives for Alternative Mode Use Alternative Work Schedules Worksite Parking Management Employment-Based Proximate Commuting Program On-Site Facility Amenities Provision Transportation Management Associations
Objective-Based Strategies	Incentives	Location Efficient Mortgages (LEM) Live Near Your Work Program
	Service Provisions	Job Access and Reverse Commute Program
Roadway Investment Strategies		Fix-It-First Strategies for Roadways Investment
Coordinating and Integrating Processes, Plans, and Functional Assignments		Performance Measures Tied to Growth Management Goals Coordinated Plan Review Process Trip Reduction Ordinances and Programs Funding Allocation Systems Tied to Growth Management Goals Land Use Expert Panels Transportation and Growth Management (TGM) Joint Program/Consortium

Table 4.1 Growth-Management Strategies and Policy Actions

Strategy		Policy Action
Urban Containment Strategies	Targeted Growth	Urban Growth Boundaries (UGB) Intermediate Growth Boundaries Urban Development Reserves Urban Service Areas/Boundaries (USA or USB) State Capital Investment Priorities Development Policy Areas Land Use Information Systems
	Compact Development	Infill Development Cluster Development Brownfield Redevelopment
	Zoning Approaches	Mixed-Use Land Development Planned Unit Development (PUD) Overlay Zoning/Districts Minimum Density Zoning/Standards Upzoning/Downzoning Rehabilitation Zoning Codes Inclusionary Zoning Interim Zoning Floating Zones
	Property Taxation	Targeted Tax Abatement Split-Rate Property Tax
	Extrajurisdictional Controls and Agreements	Extraterritorial Jurisdiction Annexation and Municipal Incorporation Interjurisdictional Agreements Tax-Base Sharing Developments of Regional Impact (DRI)
Natural Resource Preservation	Land Preservation	Land Acquisition and Banking Transferable Development Rights (TDR) Purchase of Development Rights (PDR) Conservation Easements Farmland Preservation Credits Differential Assessment Programs Agricultural and Forest Programs Sensitive Area Zoning
	Water Protection	Water Quality Protection Programs Water Quantity Protection Programs
Facility Adequacy, Timing, and Planning	Facility Planning	Capital Improvement Programs (CIP)
	Facility Adequacy	Adequate Public Facility (APF) Standards/Requirements
	Facility Financing	Development Exactions Impact Fees Special Financing Districts Cost-based Utility and Stormwater Fees
	Growth Limits/Controls	Growth-Phasing Systems for Public Facilities Development Caps and Rate Allocation Systems Carrying Capacity Limitations Moratoriums and Interim Development Regulations
Coordinating and Integrating Processes, Plans, and Functional Assignments	Plans	State Development Plans Comprehensive Plans Specific-Area Development Plans Strategic Policy Plans
	Processes	Streamlined Permit Processing Vertical Plan Consistency Requirements Horizontal Plan Consistency Requirements Cross-Acceptance Process Comprehensive Plan Consistency Requirements State Policy Assessment
	Functional Assignments	Regional Growth Management Hearing Board Regional Planning Councils Regional Service Provider

4.1.1Literature Review

An extensive literature review on the topics of growth management, sprawl mitigation, and smart growth provided the basis for the development of the list of strategies and policy actions. The literature review encompassed searches on the World Catalog, the Extended Academic Index, ABI Inform, EBSCOE, Engineering Index, Legal track, TRB databases, each state-level department of transportation research center's online reports and materials, Web of Science, Ingenta Database, and LexisNexis databases. The combined databases enable searches for salient material covering over 30,000 journals and millions of articles. This literature review turned up several efforts to catalogue sprawl mitigation strategies, though none as comprehensive as the effort in this study, and none designed to provide guidance to communities in the selection of policy actions appropriate to their specific context. Several of these previous efforts are described below.

- The City of Austin Transportation, Planning and Design Department (2001) uses the Smart Growth Criteria Matrix to analyze development proposals within the desired development zone. This matrix has limited application because it has been tailor-made for a specific city and department, covering only local actions. It fails to consider many goals of smart growth and focuses exclusively on how and where development occurs, and tax base enhancement. Hence, it can be used only for the purpose of project evaluation.

- The Smart Growth Network (2002) developed a list of 100 smart growth policies for communities to consider. This list does not provide guidance on appropriate contexts for different policies, however. In a similar effort, the National Association of Counties (2001) has developed an extensive list of strategies with corresponding benefits and concerns. This list also does not provide guidance on appropriate contexts.

- Nelson and Duncan (1995) have developed a matrix titled "Technique Effectiveness Continuum" to measure the effectiveness of growth-management related strategies and policy actions. This matrix considers only four goals: resource preservation, urban containment, efficiency of public facilities, and meeting market demands. It does not cover transportation-related policy actions.

Over 200 hundred articles, reports, and books were retrieved to assess the state of knowledge on the "effectiveness" of various transportation and growth-management strategies and policy actions. The ranking system used to convert the literature review data into an easily understood effectiveness matrix is described in greater detail in this chapter.

4.1.2 Expert Panel Review

An expert panel of thirteen researchers from growth management and transportation was selected to review the preliminary version of the sprawl mitigation matrices. A packet that included the matrices, detailed descriptions of the dimensions of the matrices (policy actions, goals, characteristics, and suitability factors), and directions for providing feedback was mailed to the panel in the last week of May 2002. Table 7 lists the nine panelists whose feedback was received through June and July. Panelists provided comments on: the specific entries in the matrices; the lists of policy actions and definitions of goals, characteristics, and suitability factors; and the general approach to cataloguing sprawl mitigation strategies and policy actions.

Table 4.2 List of Panelists

Serial No.	Name of Panelist	Institution/Affiliation
1	John M.DeGrove	Eminent Scholar Chair in Growth Management and Development, Florida Atlantic University
2	Arthur C. Nelson	Professor, City Planning Program, Georgia Tech.
3	Kevin Krizek	Visiting Assistant Professor, Urban and Regional Planning Program, Univ. of Minnesota
4	Robert B. Cervero	Professor, Dept. of City and Regional Planning, Univ. of California at Berkeley
5	Genevieve Giuliano	Professor, School of Policy, Planning and Development, University of Southern California
6	Todd Litman	Victoria Transport Policy Institute
7	Robert Dunphy	Urban Land Institute
8	Douglas Porter	Urban Land Institute
9	Ruth Steiner	Associate Prof., Dept. of Urban and Regional Planning, Univ. of Florida

As a first step toward incorporating the panelists' feedback, a version of the matrices was prepared that showed for each cell in each matrix whether a panelist had recommended a change

to that cell. Second, a database of the comments pertaining to each cell in that matrix and the suggested changes was compiled. Third, each of the six matrices was reviewed one at a time, along with the panelists' comments, in order to determine whether changes should be made. The criteria used in making changes were as follows:

- Only cells having two or more panelists' comments were considered for modification.
- In cases of multiple but divergent suggestions for changes, majority opinion was considered.
- In Matrices C-1A and C-1B, if a cell had originally been left blank (indicating that it is not a goal of the specific policy action) and was suggested by one panelist to be a secondary goal and by another to be a primary goal, then the former's opinion was accepted. This ensures a conservative and safer estimate of the impact of the policy actions.
- For cells with only one comment, the judgment of the research team was used to decide in favor of or against the suggested changes.

In addition, the list of strategies and policy actions was revised and expanded based on the panelists' suggestions and joint review by the research team. The matrix cells corresponding to these added policy actions were filled based on the judgment of the research team.

A second round of expert input was sought on the effectiveness of the strategies and policy actions noted in Matrices C-1A and C-1B. The original group of thirteen reviewers was asked to assign effectiveness ratings on a three-point scale (three, very effective; two, somewhat effective; and one, not very effective) for each transportation and growth-management policy action as it related to specific goals in Matrices C-1A and C-1B. Furthermore, each panelist was asked to complete a short questionnaire to identify the most important strategies and policy actions to promote transportation and growth-management goals by rank cluster. The matrices and survey instrument were mailed February 27, 2003, with multiple follow-up requests. However, because of a low response rate (only five panelists submitted results by June 2003), the expert panel pool was expanded based on recommendations from the research team to include Christopher Porter (Cambridge Systematics, Inc) and Dr. Kelly Clifton (University of Maryland, Smart Growth Research Center). As a result, the expert panel effectiveness Matrix C-4A and C-4B is based on

the mean score provided by seven expert panelists: Dr. Ruth Steiner, Dr. Robert Cervero, Dr. Chris Nelson, Dr. Kelly Clifton, Dr. Kevin Krizek, Mr. Todd Littman, and Mr. Christopher Porter.

To obtain practitioner-based insights on effectiveness of various transportation and growth-management strategies and tools in Texas, all 25 Texas Metropolitan Planning Organizations (MPOs) were surveyed on what transportation and growth-management strategies and techniques they believed were most effective. However, only four Texas MPOs responded to the survey despite multiple follow-up requests, and only one MPO actually filled out the matrix to assign effectiveness values for the strategies and policy actions. The two main reasons given by Texas MPOs for not completing the survey were that they were "too busy" or did "not have enough knowledge" to respond with any great confidence. The fact that many MPOs felt they lacked sufficient knowledge confirms the need for the other two approaches — expert panel data and a literature review — to better inform Texas transportation practitioners on effective choices to promote smart growth. The Texas MPO survey responses are reported in Appendix E.

4.2 GOALS MATRIX

Appropriate techniques for mitigating urban sprawl depend heavily on the particular aspect of sprawl that requires remedy. As Johnson (2002) points out, different metropolitan areas may face different negative impacts of sprawl and to varying degrees. Hence, it is important for communities to find strategies that effectively address their goals. The goals matrices (Matrices C-1A and C-1B in Appendix C) are designed to help agencies identify possible solutions to the specific sprawl-related problems that they seek to address. The goals defined for the matrices reflect the focus of this project on the role of transportation as a solution to sprawl and a motivation for smart growth. These goals are closely interrelated, yet each reflects a slightly different perspective or concern. In addition, because a strategy or policy action is likely to fulfill many goals if implemented in the right manner, the goals matrices thus indicate the direct or "primary," as well as indirect or "secondary," goals of policy actions.

1. *Provide Transportation Choices:* Provide a range of transportation choices beyond the automobile, including transit, walking, and bicycling. This goal is closely related to the

goals of promoting social equity, promoting accessibility, and reducing auto vehicle miles traveled (VMT). Policies designed to manage the expansion of the urbanized area can also help to provide transportation choices.

2. *Reduce Auto VMT:* Reduce total VMT by automobile. This goal is closely related to the goals of managing congestion and minimizing environmental impact. Policies designed to provide transportation choices can help to reduce auto VMT but do not guarantee that drivers will choose the alternatives. Policy actions that promote infill development also tend to create more multimodal land use and reduce VMT.

3. *Manage Congestion:* Manage congestion in the road system without necessarily reducing vehicle travel. This goal is closely related to the goal of reducing auto VMT but emphasizes policies designed to shift travel out of peak periods.

4. *Ensure Adequate Level of Service:* Ensure that the road system provides an adequate level of service in terms of travel times and delays, traffic signal coordination, and that the transit system provides an adequate level of service in terms of frequencies and geographic coverage. It also entails the prevention of traffic spillover to neighborhood streets. This goal is closely related to the goals of managing congestion and providing transportation choices.

5. *Promote Land-Use Accessibility:* Promote accessibility to needed and desired services, including job centers, stores, medical services, parks, etc. This goal emphasizes policies that shape development patterns so that activities are closer together. Policies that promote accessibility also help to provide transportation choices by bringing activities within walking and bicycling distance. This goal is also related to the goals of promoting social equity and strengthening community livability.

6. *Manage Expansion of Urbanized Area:* Manage the expansion of the urbanized area so that land is used efficiently as population grows and scattered pockets of development are avoided. This goal is closely related to the goal of preserving natural resources and open

space and to the goal of minimizing environmental impact. Managing the expansion of the urbanized area requires close coordination between land use and transportation planning.

7. *Preserve Natural Resources and Open Space:* Preserve natural resources and open spaces, including waterways, wildlife corridors, and plant and animal habitats for environmental, economic, and/or social purposes. This goal is closely related to the goal of minimizing environmental impact but focuses on impact on land rather than air quality or water quality. Policies that help to manage the expansion of the urbanized area usually help to preserve natural resources and open space.

8. *Minimize Environmental Impact:* Minimize the impact of transportation and development on the environment, particularly impact on air quality and water quality. Impact on wildlife habitats and open space is considered in the goal of preserving natural resources and open space. Policies that reduce auto VMT also help to minimize environmental impact.

9. *Promote Economic Vitality:* Promote the vitality of local economies, particularly in older communities and neighborhoods. This goal is related to the goals of strengthening community livability and promoting social equity.

10. *Promote Social Equity*: Promote social equity by ensuring that "transportation disadvantaged" populations, including low-income households, the elderly, and persons with disabilities, have adequate access to needed and desired activities and do not disproportionately bear the costs of transportation and development. Policies that promote accessibility or reduce cross-subsidies from urban to suburban residents and provide transportation choices usually promote social equity. Policies that affect the price of transportation or development may work for or against social equity.

11. *Strengthen Community Livability:* Strengthen community livability by enhancing quality of life environmentally, economically, and socially in existing neighborhoods. Policies

that strengthen livability in existing communities help to manage the growth of the urbanized area. This goal is also related to the goal of promoting accessibility.

12. *Strengthen Coordination:* Strengthen coordination between agencies within a region, between agencies at different levels of government, between agencies with transportation and land-use responsibilities, between public agencies and the private and nonprofit sectors, and in order to achieve growth-management objectives. Strengthening coordination helps to facilitate the achievement of all other goals.

Several reviewers provided insightful comments about this list of goals. For example, one panelist commented that corridor preservation does not aim to only preserve rights-of-way for future mobility, but also to prioritize investment and encourage coordination among agencies or levels of government. Another panelist suggested the addition of "providing affordable housing" to the list of goals, citing traditional neighborhood development and targeted tax abatement as examples of policy actions directed toward this goal. A third panelist was of the opinion that goals such as minimizing adverse land use interactions, minimizing public costs, and facilitation of urban land cycling might be included. Individual communities may add or modify the matrices in light of additional social, physical, and environmental goals and concerns that they feel deserve extra attention beyond those identified by our literature review and expert panelists. Likewise, new policy actions will develop through experimentation and learning, and these can be added to the matrices as well. In short, the matrices offer a sound starting point, but should not be treated as all encompassing or as static end points. They can and should be modified to suit the users to reflect change and needs.

4.3 CHARACTERISTICS MATRIX

After identifying policy actions that address the goals of a community, an agency must then consider its practical needs and its available resources. Depending on its characteristics, a particular policy action may not be feasible for a particular community. The characteristics matrices (Matrices C-2A and C-2B in Appendix C) are designed to help agencies eliminate from consideration those policy actions that are infeasible for their communities. The characteristics

included in the matrices were selected and defined based on the literature review and comments from the expert panel. The list is not comprehensive, but rather focuses on key characteristics that influence feasibility. Policy actions are categorized on each characteristic, as described below. However, this categorization is often not straightforward. Are urban growth boundaries, for example, a well-established or an experimental policy action? In addition, a combination of policy actions implemented together may take on a different set of characteristics than any one of the policy actions on its own. The specific design of the policy action in a particular community may also influence its categorization on these characteristics. The matrices thus provide general guidance on feasibility, rather than a definitive assessment.

1. *Policy Action Experience* (Well Established vs. Experimental). *Well-established* policy actions are those that have been practiced for a considerable period of time by many local or state governments or other implementing agencies and for which substantial empirical evidence exists to corroborate their effectiveness as a sprawl mitigation tool. On the other hand, *experimental* policy actions are those that have been implemented by few local governments or states as pilot or demonstration projects and that are backed primarily by theoretical argument rather than empirical evidence.

2. *Administrative Approach* (Planning vs. Market vs. Regulatory vs. Capital Investment). *Planning*-approach policy actions are those that do not involve regulation, pricing strategies, or capital investments. They may include coordinated planning processes, dissemination of information, guidelines through public-sector plans, or the encouragement of alternative choices. *Market*-based policy actions are those that use market mechanisms such as prices to effect change. Pricing policies can act as either incentives or disincentives and may generate revenue for the implementing agency. *Regulatory* policies are enacted by law or ordinance and mandate or restrict certain actions. *Capital Investment* policy actions necessitate capital expenditures on the part of public agencies.

3. *Estimated Implementation Cost* (Medium vs. High). Policy actions with *low* to *medium implementation costs* do not impose a significant financial burden on public agencies, regardless of the financial capacity of the public agencies. These policy actions might also

generate revenues to offset the cost of implementation. On the contrary, *high cost* strategies impose a significant financial burden on public agencies.

4. *Estimated Implementation Period (*Short vs. Long). *Short-term* policy actions may be executed within a year or less. *Long-term* policy actions require more than a year to implement owing to extensive planning, regulatory changes, environmental analysis, construction, and/or other requirements.

5. *Enabling Authority Requirements (*Low vs. High). Policy actions that do not require special legal authority on the part of the implementing agency have *low enabling authority requirements*. Policy actions that require significant legal authority on the part of the implementing agency have *high enabling authority requirements.* Such policies may not be feasible without additional legislative action at the state level and may have long implementation periods. Regulatory approaches and some market approaches tend to fall in this category (Appendix A).

6. *Implementing Agency* (State Govt. vs. MPO vs. Transit Agency vs. County Govt. vs. City Govt. vs. Private/Nonprofit). *State governments* are key to both transportation and growth-management-related strategies, either as the implementing agency or by delegating appropriate authority to lower levels of government. Primary agencies include the state DOTs and the state agency charged with environmental protection. The power of a m*etropolitan planning organization* (*MPO)* to implement policy actions may vary. MPOs that also serve as regional councils may have more ability to take the lead on coordinated planning efforts. In most cases, MPOs have limited power to implement policy actions. *Transit agencies* and various *city* agencies may also serve as implementing agencies for many policy actions. Finally, many policy actions require the participation of *for-profit* or *nonprofit* sectors. For example, the development sector is a particularly important player in transportation-efficient land use strategies.

The panelists provided interesting comments on this matrix. In several cases, the panelists had mixed views or were themselves unsure. For example, one of the panelists was not certain

certain whether urban growth boundaries, intermediate growth boundaries, and urban development reserves should be considered "well-established, given that not many have an historical record." In addition, he mentioned that a combination of approaches can sometimes change the characteristics of individual policies. For example, transferable development rights (TDR) may be characterized as regulatory when combined with downzoning, as is normally the case. Another panelist argued that inclusionary and mixed-use zoning aim to be market-responsive, letting co-benefiting land uses interact and compete with each other and that adequate public facility (APF) standards can be costly because the marginal cost of expanding infrastructure in urban settings to accommodate new growth can be high. Such comments point to the need to warn users of the matrices that the characteristics of specific policy actions can vary depending on the situation in which they are applied.

4.4 SUITABILITY FACTORS MATRIX

Once an agency has gone through the process of eliminating infeasible strategies from the entire set, the next step is to make a judicious selection of the most suitable ones for that community. A one-size-fits-all approach is too simplistic in dealing with a problem as complex as sprawl. The suitability factors matrices (Matrices C-3A and C-3B in Appendix C) are designed to show what kinds of policy actions are appropriate for different kinds of communities and to assist communities in making these selections. The suitability factors describe the context of the community considering sprawl-mitigating policy actions. The factors included in the matrices were selected and defined based on the literature review and comments from the expert panel. The list is not comprehensive, but rather focuses on key factors that influence suitability. Policy actions are categorized on each factor, as described below. Although categories for these factors have been defined quantitatively where possible, a community can also assess its own situation qualitatively on each of these factors. These factors can be assessed at the level of the metropolitan region or for a smaller jurisdiction within the region, depending on the circumstances and the authority of the implementing agency.

1. *Size of Jurisdiction* (Small vs. Medium vs. Large vs. Very Large). This factor is defined as the population within the area under the jurisdiction of the decision-making body. Four sizes

have been defined as follows: *Small* (population less than 20,000), *Medium* (population between 20,000 and 200,000), *Large* (population between 200,000 and 1,000,000) and *Very large* (population in excess of 1,000,000). The size of the jurisdiction correlates with many other suitability factors, including growth rate, congestion level, and transportation-disadvantaged population.

2. *Rate of Growth* (Slow vs. Fast). This factor is defined by the average annual percentage change in population for a community. It can be either *slow* or *fast* depending on whether it is below or above the state average growth rate.

3. *Congestion* (Low vs. High). This factor has been measured by the percentage of freeways or arterials operating at levels of service D, E, or F. Levels of service D, E, and F are characterized by volume-to-capacity ratios above 0.80. This measure is designated *low* if less than 60% of a city's arterials and freeways operate at levels of service D, E, and F, and *high* otherwise.

4. *Transportation Disadvantaged Population* (Low vs. High). An individual is considered "transportation disadvantaged" when his or her transportation needs are not adequately met by the automobile. This includes individuals who either do not own or drive an automobile for reasons of advanced age, low income, physical handicap, and/or mental impairment. The state average is considered the threshold value to distinguish between low and high transportation-disadvantaged population.

5. *Planning and Land-Use Authority* (Counties vs. General Law Cities vs. Home Rule Cities). The amount of planning and land-use authority vested with counties and cities can vary significantly. The *county* is generally the most limited of the many forms of local government in a state. Cities can fall into two categories. They can either be *general law cities*, meaning they are restricted by the state constitution, or they can be *home rule cities*, in which case they are restricted by the state statutes.

6. *Planning Culture* (Limited Planning and Land-Use Control vs. Pro-Planning and Land-Use Control). This factor describes the traditional planning approach of a state, region, or locality with regard to growth management and land-use controls. *Limited planning and land-use control* jurisdictions adopt a businesslike approach and seek to minimize land-use transaction costs, planning mandates, regulatory requirements. The political culture in these jurisdictions do not support the use of public policy instruments to intervene in private real estate development decision making, but instead focus on providing a steady supply of buildable land. On the other hand, *pro-planning* jurisdictions (state, regional, and local) pursue and promote proactive growth-management approaches. They typically have growth-management policies, future land-use maps, and development regulations that implement those policies in place. The planning culture typically varies along a continuum between these two extremes from region to region and locality to locality within a state.

The issue of applicability to multiple situations or settings seemed to stand out in this matrix. Two of the panelists mentioned that distinctions between contexts are subtle and many policy actions may also be justified in slow-growing, moderately congested areas. For example, tax-base sharing could be applied equally well to both fast- and slow-growth settings. Some panelists suggested the addition of certain factors such as development context (urban, suburban, urbanizing, new Greenfield development, etc.), and natural (water bodies, hills), and political barriers (state, national, federal/state ownership). A valid argument was put forth by one of the panelists who claimed that pricing reforms may reduce the need for subsidies from non-drivers to motorists that can then be used to improve non-automobile modes, and are therefore not necessarily unsuitable for areas with a high transportation-disadvantaged populace.

4.5 EFFECTIVENESS MATRICES

While selection of strategies and policy actions that are contextually relevant and suitable to a jurisdiction's culture, capacity and needs are important considerations. Another key factor is whether those strategies and policy actions are likely to be effective once implemented. Matrices C4-A and C4-B present the results from the expert panels' effectiveness evaluations as well as summary data from the literature review. The expert panelists assigned the following values in

their review of strategies and policy actions: "3" for very effective, "2" for somewhat effective, and "1" for not effective. The scores reported in each cell are the mean scores of all seven reviewers. Thus, values approaching 3 are most effective, those clustered near 2 are somewhat effective, and those much below 2 are less effective. A logical decision rule to provide easily understood qualitative descriptors would be to use percentiles (33.3 and 66.6) to divide the overall matrix values into thirds. Thus, in the transportation effectiveness Matrix C-4A, the cut points for the most effective policy actions would be all cells with values above 2.15, those between 1.72 and 2.14 would be somewhat effective, and those below 1.71 not as effective. In the growth-management effectiveness matrix the cut points would be all cell values at or above 2.28 as very effective, those between 1.86 and 2.27 as somewhat effective, and those less than 1.86 as not effective. It is important to note that several panelists believe that in "the best of all worlds" we would consider effectiveness premised on "packages of strategies" that can be applied to specific situations based on our empirical knowledge. However, the state of knowledge on the effectiveness of "packages" of transportation and growth management strategies and the conditions that we would consider as important are not agreed upon. That shortage of empirical knowledge on packages or "systems" of approaches is discussed further in the concluding chapter. To ease interpretation, two additional matrices are provided (C4-A1 and C4-B1) which simply have qualitative indicators of low, medium and high inserted in cells that had the cut points noted above.

In terms of mitigating sprawl through transportation strategies, the panelists had a high degree of agreement that communities would be best served and most effective in pursuing transportation-efficient land-use planning and development strategies, pricing strategies for roadways and transit, and alternative-mode support strategies. Among those strategies, the panelists felt that bus rail transit and light rail transit-oriented development, congestion pricing (HOT, Cordon, and AVI), parking demand management, and nonmotorized facility support actions offered the highest potential for effectiveness.

In the realm of growth-management strategies and tools, the expert panel identified urban containment and natural resource preservation strategies as the most effective approaches to mitigate sprawl. The panelists were evenly divided in terms of the most effective tools and approaches of urban containment. Targeted growth through urban growth boundaries, priority-funding areas, infill development, mixed-use zoning, and brownfield development were all

among the more promising approaches identified. Land acquisition and land banking to protect sensitive resource lands, as well as a complement to infill and target growth strategies, was also identified by most panelists as a very important approach to mitigate sprawl.

A second source of information in the effectiveness matrices are the literature review summaries. Each book chapter, article, report, or news article read by the research team was coded for the type of empirical evidence it provided. A rating system of empirical evidence based on a four-point scale was created, where increasing levels of empirically reliable evidence received higher scores. Solid multivariate analyses received a value of three because these studies typically involved probability sampling (which allowed some level of generalization beyond one or two cases) and statistical controls for rival explanatory variables. Case studies obtained a score of two because these studies, when well executed, also provide important real-world data on the effectiveness of various strategies and techniques but only in a limited number of settings. Thus, while case studies can typically be quite strong in weighing multiple explanatory variables simultaneously and can provide deep understanding of complex phenomena, they typically do not offer much strength in terms of generalization to other settings. Theoretical and simulation studies received a score of 1. Although these approaches can offer important theoretical and pragmatic insights to transportation and growth-management issues, those insights are contingent on the extent to which the model's simplifying assumptions are too far removed from reality to be relied upon to a very large degree. Finally, some studies and reports rely in large part on anecdotal accounts of how effective various tools and techniques have been in practice. However, because these accounts do not have the benefit of social science protocols to ensure quality control, they receive a value of .5.

The mean value of studies with both positive and negative results are reported in the effectiveness matrix (where data was available in the literature). For example, in Matrix C-4B the weight of empirical literature on urban growth boundaries supports the opinion of the expert panel. The score shows that there is more weight in the empirical evidence that urban growth boundaries can be effective in mitigating sprawl than ineffective (score of 2.1 positive results, as compared to a 1.5 score for empirical studies showing negative results).

A second set of figures are presented so the user can also see the weight of evidence as expressed in a ratio of the number of positive to negative study results. So, in addition to a weight of evidence measure, we also leave it to users to assess the weight of evidence based on

the total number of positive and negative study results. In the case of urban growth boundaries, there were about five positive study results found in the literature review for every one negative report on its effectiveness. This analysis can be taken a step further by following up on the literature review rankings and obtaining the studies to review. We have provided a CD-Rom as part of this report that includes the original literature review spreadsheet that notes: (1) each study identified, (2) the empirical evidence relied upon, (3) the key findings (where available), (4) other strategies and tools that should be used to complement the sprawl mitigation effort; (5) full citations, and (6) an electronic copy of articles and reports (when available). A complete bibliography by strategy and policy action is presented in Appendix D of this report as well.

4.6 CONCLUSIONS

The eight separate matrices that make up the sprawl mitigation matrix offer an important tool kit for communities considering smart growth opportunities. Using the matrix, Texas communities can review the goals, strategies, and tools available to them (Matrices C-1A and C-1B); consider their legal, fiscal, and administrative capacity for change (Matrices C-2A and C-2B); review the tools and choices in light of their own planning culture, growth rate, and constituent needs (Matrices C-3A and C-3B); and select among those strategies most likely to be effective in promoting the goals that they care about (Matrices C-4A and C-4B). The following chapter shows how portions of the sprawl mitigation matrix can be used as a diagnostic to identify additional approaches to mitigate sprawl or promote smart growth in Texas communities.

CHAPTER 5. CASE STUDY APPLICATIONS

5.1 INTRODUCTION

This chapter presents three case studies of the smart growth matrix applied to three levels of government: a city, a regional government, and a state department of transportation (DOT). The City of Dallas has what might be called a *laissez faire* view of land-use-oriented strategies and tools, preferring to let the market work its will on the location, functioning, and quality of its urban development patterns. However, the City of Dallas along with other regional transportation planning and provider organizations, is very proactive and sophisticated in its transportation-related strategies and policy actions. By comparison, Portland Metro and its partners have a much longer tradition and cultural acceptance of planning and regulation to obtain a desired future urban form, but in some ways are not doing as much as Dallas on major transportation infrastructure and policy actions. Moreover, as a regional government, some policy choices outlined in the matrix can only be encouraged, not implemented. Lastly, the Maryland DOT, which is very far removed from land-use planning and regulatory control, but nevertheless is very active in facilitating and supporting important transportation and growth-management efforts at the regional and local level, and the smart growth matrix identifies additional areas where it, too, could expand its efforts and possibly be more effective.

5.2 CASE ONE: DALLAS, TEXAS

The City of Dallas is part of the North Central Texas Council of Governments (NCTCOG). The region has experienced tremendous growth in the past decade. The NCTCOG estimates that in the three years since the 2000 Census, the region has grown at a rate of 7%. However, most of this growth occurred outside of the Dallas city limits. Indeed, from 1990 to 1998, the City of Dallas captured only 6.5% of the region's near 17% growth as a result of having very little residential development in the downtown area (NENW 2001). The recession years of 1990 to 1995 caused the central business district (CBD) vacancy rates to climb to nearly 40%, or more than 3.5 million square feet (NEMW 2001). The highest class of office space that

also commands the highest rents, Class A, shifted from the downtown to newer suburban developments. As a result of this massive growth in the surrounding areas, many of Dallas neighbors, nearby inner-ring suburbs, and smaller cities around Dallas, have developed smart growth or similar programs to deal with this growth. Plano, Frisco, Flower Mound, and Addison all have plans or projects in place to improve the quality of new development and to use land more efficiently than in the past. This increased interest in the quality and efficiency of land-use development by Dallas's neighbors may be driven in part by community desires for better places, but it certainly is influenced by problems created with ever-increasing vehicle miles traveled (VMT) and the air pollution they generate.

Air quality is a major concern for the Dallas region. The Dallas-Fort Worth area has been in non-attainment for ground-level ozone since the early 1990s. As a consequence, the cities in the area must submit plans to the Environmental Protection Agency (EPA) for how they intend to rectify the current air quality problems. The current state implementation plan (SIP) is undergoing a midcourse review, but several major commitments include a reduction in pollutants from motor vehicles and an employee trip-reduction program in nine counties in NCTCOG.

The City of Dallas does not have an overarching urban vision or future land-use map depicting a desired urban form, indeed the term "smart growth" is not looked upon favorably in many circles. This is due, in large part, to Dallas's need to lure development away from the suburban fringe. Poor economic conditions within the city in the 1980s and early 1990s drove most of the new development outside the city boundaries. Since that time, it is clear Dallas does not want to do anything that can be perceived as limiting or restricting growth. Dallas is a fairly sophisticated region from a transportation perspective, but is somewhat more limited in its growth-management concerns. As a result, it is not surprising that the review of the secondary literature and interviews with Dallas stakeholders suggest that the key goals for the City of Dallas are limited largely to:

1. Providing transportation choices,
2. Reducing VMT,
3. Managing congestion,
4. Promoting economic vitality, and
5. Strengthening community livability.

The following sections briefly review what is already in place in terms of transportation, and growth-management strategies and tools to implement these goals (this is also summarized in matrix form in Appendix F), and then analyzes likely new directions based on the smart growth matrix being applied to the Dallas context.

5.2.1 What's in Place? Transportation-Related Strategies and Policy Actions

5.2.1.1 Transportation-Efficient Land-Use and Planning Development Strategies

5.2.1.1.a Light Rail Transit (LRT)-Oriented Development, Downtown Revitalization, Parking Supply Management, Neighborhood Conservation Program

LRT-oriented development has proven very successful in Dallas as in many U.S. cities that moved toward fixed rail systems, and should help to reduce VMT. Many infill and brownfield redevelopment projects have been completed in the area around stations in the last decade. Mockingbird Station is the prime example, covering 10 acres just 4 miles north of downtown. The main body of the station is a renovated brick warehouse dating from the 1940s. The commercial uses at the station vary from a multi-screen movie theater to upscale retail chains, including local restaurants and a chain coffee shop. It also features 211 loft-style apartments, 250,000 square feet of office space, and 1,440 mostly underground parking spaces. The station has been extremely successful, with high residential occupancy and high usage statistics. A case study of the station conducted by Gloria Ohland confirms the success of Mockingbird Station as functional transit-oriented development (Ohland 2001). Notably, this site was developed without public assistance though the site is located in a tax-increment financing district. After the completion of the project, the developer Ken Hughes began working with the City of Dallas to obtain federal transportation funding to improve pedestrian access to the station along Mockingbird Lane.

Undertaken more as an economic strategy to maintain the viability of the city in the wake of so much growth moving to surrounding areas, Dallas has a very strong downtown revitalization program. The recession years of 1990 to 1995 caused CBD vacancy rates to climb to nearly 40%, or more than 3.5 million square feet (NEMW, 2001). The highest class of office space that also commands the highest rents, Class A, shifted from the downtown to newer

suburban developments. To achieve the required population densities to make mixed-use developments effective in the downtown, a major push began to locate more housing there. This topic is covered more thoroughly in the land-use section of this report, under Infill and Mixed-Use Development. The principal means of parking supply management in Dallas comes through reducing minimum parking spaces requirements for developers who encourage alternate-mode use or carpooling. This is done primarily to ease congestion and improve air quality.

Preserving the atmosphere and character of quality neighbors that already exist and keeping that quality high is a key step in maintaining economic vitality and strengthening community livability. Seven neighborhoods in Dallas are now protected in conservation districts. Most notable are King's Highway Conservation District, the North Cliff Conservation District, and the Bishop/8th Conservation District.

The Trinity River Corridor Project is the most significant corridor preservation and management activity occurring in Dallas. It is still in development, but is slated to include the building of levees, wetlands, a downtown lake, gateway parks, trails, equestrian centers, and an interpretive center. Ecological concerns are handled in the expansion and preservation of the Great Trinity Forest through the acquisition of 2,700 acres of land along the Trinity River. Transportation improvements including the Trinity Parkway and the Woodall Rodgers Extension Bridge (Trinity River Corridor Project 2003). A future opportunity for major corridor-planning improvements is the Pegasus Project in conjunction with the Federal Highway Administration, Texas Department of Transportation (TxDOT), and NCTCOG, which will transform the two major interstate highways directly serving downtown Dallas, by totally redesigning IH 30 from Sylvan Avenue to IH 45, and IH 35E from Eighth Street to Empire Central Drive (north of SH183).

5.2.1.2 Pricing Strategies and Alternative-Mode Support Strategies

5.2.1.2.a Toll Roads, High Occupancy Vehicle Lanes, and Park and Ride Lots

Under the North Texas Tollway Authority (NTTA), Dallas has three tollways: President George Bush Turnpike, Dallas North Tollway, and Addison Airport Toll Tunnel. The NTTA, a political subdivision of the State of Texas under Chapter 366 of the Transportation Code, is empowered to acquire, construct, maintain, repair and operate turnpike projects; to raise capital

for construction projects through the issuance of turnpike revenue bonds; and to collect tolls to operate, maintain, and pay debt service on those projects (NTTA 2003). Current high occupancy vehicle (HOV) lanes in Dallas are at I-35E (Stemmons Freeway); I-635 (LBJ Freeway); I-30 (East R.L. Thornton Freeway); and I-35E/U.S. 67 (South R.L. Thornton/Marvin D. Love Freeway). HOV lanes service more than 100,000 vehicles each weekday in four lanes over 31 highway miles (DART Agency/System Overview 2003). The total number of commuter trips in fiscal year 2002 was 34.2 million, with a subsidy of only 13 cents per passenger. HOV use is promoted as a way to reduce congestion and improve air quality. Dallas has fourteen park and ride transit facilities, with more in the greater Dallas Area Rapid Transit (DART) service area. These areas offer free public parking, ranging from 200 to 1,200 spaces.

5.2.1.2.b Non-motorized Mode Facility Support, Traffic Calming and Carsharing, Vanpooling, and Ridematching Services

DART also supports bike commuters, to varying degrees. To bring a bike on the bus, DART requests a bike permit, through which DART can determine bike commuter demand. Bikes are brought on the bus, so local service buses only allow bikes on board during off-peak hours. Express buses allow bikes in the cargo compartment at all times, however access to the bikes is only given at DART Transit Centers and in the downtown area. Bikes are also brought onto light rail trains and limited to off-peak hours as well. Bike parking is provided at most transit centers and some light rail stations (Bicycle Commuting 2003).

Traffic-calming measures used in Dallas include speed humps, chicanes, lane narrowing, parking shelf, and a traffic circle in a neo-traditional neighborhood. Traffic-calming measures were also included in a planned unit development (PUD) for the State-Thomas neighborhood.

DART operates a computerized matching list for carpooling in its service area. The RideMatch system also tells a person the length of the commute, its cost, and the amount of air pollution generated. DART organizes vanpools for employers for six to fifteen employees per van, at a cost of under $500 each month. DART provides training, a van, and insurance. Carpools and vanpools attracted 359,930 riders in fiscal year 2002 with a 48 cent subsidy per passenger (DART Agency/System Overview 2003).

5.2.1.2.c Commuter Rail, Light Rail Transit and Bus Rail Transit Investments, Public Education

Because a major part of the reason for Dallas's non-attainment status regarding air quality comes from auto exhaust, considerable attention is paid to promoting alternatives to the traditional single occupancy vehicle (SOV) commute. As in many major metropolitan areas in this country, rush hour traffic congestion has only become worse with growth. DART was created in August 1983 by a regional vote to provide auto users with more mode choices and as an economic development stimulus tool for redevelopment. A one cent sales tax took effect in 1984 to provide funding for the service, which includes bus service, light and commuter rail (DART Rail and Trinity Railway Express 2003), HOV lanes, and carpooling. DART acquired the Dallas Transit System in 1988.

Planned increases in light rail and HOV lanes through the 1990s made DART the largest light rail expansion program in North America in 2000 (DART History 2003). DART light rail serves 700 square miles of the Dallas-Fort Worth area with 44 miles of light rail as of December 2002, 34 stations, and an average weekday ridership of over 55,000 people (Agency/System Overview 2003). The per passenger subsidy in 2002 was $2.76. Its initial budget for 20 miles and 20 stations was $860 million. North Central and Northeast construction had a budget of $1.011 billion for 24 miles and 14 stations. DART won the 1997 Outstanding Achievement Award from the American Public Transit Association. The Trinity Railway Express diesel commuter rail has 34 miles of tracks and nine stations. Its average weekday ridership measured near 8,000 in February 2003.

Through television ads, billboards, outreach programs, and an informative Web site, DART reaches out to the community to promote its various services. Mostly working the economic and convenience angles, the information provided also addresses the air pollution concerns of the city.

5.2.1.3 Worksite-Based Strategies

5.2.1.3.a Monetary Incentives for Alternate-Mode Use

DART offers several programs through the workplace that allow the employer to give transit access as a form of compensation or to allow the employee to pay for transit expenses before taxes. The annual pass offers an estimated savings of $5,000 to the employee through

savings on fuel, vehicle maintenance, depreciation, and insurance. Vanpools can be funded through this pretax method, though DART encourages partial or total employer subsidy.

5.2.2 What's in Place? Growth Management-Related Strategies and Policy Actions

5.2.2.1 Urban Containment Strategies

5.2.2.1.a Infill, Mixed-Use Development, and Brownfields

Promoting economic vitality in the city is the primary purpose of infill development, but it also improves livability in the central city. The movement of the majority of office space in the region to outside of downtown forced Dallas to alter its focus and concentrate on making the downtown vibrant again. The Dallas Plan, a nonprofit organization dedicated to policy planning for the City of Dallas, recognizes the core assets of what makes Dallas an attractive place to live and work. To date, its focus on building on these assets has led to its success with substantial infill development.

Much of the infill development is mixed use. Mixed use is most notable in the conversion of historic buildings in the CBD to residential and mixed-use units. For example, Spire Realty Co. purchased the Mercantile complex, a four-building 900,000 square foot property on Main, Ervay, and Commerce streets for mixed-use development (Dallas Plan). Some redevelopments faced difficulties with the Texas Historical Commission and required modifications to plans, such as the Kirby Building, dating from 1913 (NEMW 2001). Infrastructure upgrades have also been required to bring older buildings to current code. The city offers some forms of assistance, such as tax increment financing (TIF), but infill development depends primarily on private investments. The State-Thomas neighborhood was redeveloped privately as a PUD, with TIF and the city covering the costs of all public space improvements (NEMW 2001). Addison, a suburb of Dallas, has a well-recognized success in high-density urban, mixed-use development with Addison Circle. The city's 1991 comprehensive planning effort identified a need for more concentrated development, and this occurred on a single-owner property adjacent to a DART station and close to employment, retail, and entertainment facilities.

Brownfields present a difficult infill issue, but Dallas has made tremendous progress in improving what is frequently a difficult development situation. Dallas began a brownfield

program with EPA Region 6 in 1995, known as the Dallas Brownfields Program. Many brownfields are located in economically disadvantaged areas of the city, making a brownfield program a key means of improving social equity. It has been very successful and won several awards from the EPA, including the Assessment Demonstration Pilot, Brownfields Cleanup Revolving Loan Fund Pilot, and Job Training Demonstration Pilot grants. In addition, Dallas is one of three cities selected as a Clean Air/Brownfields Pilot project. Dallas's pilot program is also notable for having leveraged over $840 million in redevelopment funding from the private and public sector, more than any other pilot program. This kind of investment also supports the economic vitality of the city. Dallas's Brownfields Program has a public-private partnership that offers economic tools and incentive such as tax abatement on value added to the property (with city council approval), partial or full funding of city infrastructure necessary for the operation of the brownfield, and cooperation with TIF districts. The program also provides assistance at no cost for Phase I environmental analysis for various sites and has developed criteria for conducting Phase II Environmental Site Assessments.

The Dallas Brownfields Program received national press coverage in the August 6, 2001, issue of Time magazine. A former landfill and cement company site, the Centennial Plaza Addition was a successful conversion to commercial and warehouse space under the Dallas Brownfields Program Spurs Neighborhood Revitalization. The South Side on Lamar Project made use of a brownfield in a declining neighborhood to convert a nine-story building for 455 residential lofts with commercial and retail uses on the main floor. This project has an 85% occupancy rate, and it continues to develop with more commercial uses. Other projects that are a direct result of these partnerships are the Cass Street site reuse, transportation improvements in the Tenth Street Neighborhood, and the development of the Texas Buckeye Trail. Success stories include: Dallas Fire Station 34, a former used car lot and gas station site; the American Airlines Center, built on former cooling ponds for a power plant; and the new Dallas Police Headquarters site across from South Side on Lamar in the Cedars neighborhood (Dallas Brownfields Program 2003). The new American Airlines Center development won the 2000 Environmental Engineering Excellence Award from the Consulting Engineers Council of Texas (Dallas Plan 2002).

5.2.2.1.b Planned Unit Developments, Tax Increment Finance, and Annexation

PUDs are found in Dallas to a limited extent. The clearest and most successful example is the State-Thomas neighborhood, an area near the CBD that mainly had been vacant. The public-private partnership formed over the PUD required a large investment in public space improvements (NENW 2003). The PUD created a pedestrian-friendly residential neighborhood that has since become very desirable in the Dallas real estate market. The high price of the new housing in the area has created some concern with the existing residents in what had been a historically African American area. Again, the primary motivation was economic gain for the city, but this PUD also had the effect of improving livability in the city and potentially reducing congestion.

Property taxation is also involved in growth management in Dallas. The Dallas Economic Development Division of the Department of Development Services provides a guide to developers in Dallas to assist in planning projects and "sustaining acceptable levels of growth." (Dallas Economic Development Department 2003). The city designates TIF districts, while public improvement districts are created at the request of the property owners within the district. TIF districts finance new public improvements to stimulate new private investment in designated districts. Dallas currently has seven TIF districts. Any increase in tax revenues caused by new development or increased property values goes into the TIF fund for roads, utilities, streetscapes, and lighting improvements for the district. Funds also can be used for more specific measures such as demolition, façade purchases, environmental abatements, and public parking in some instances (Area Redevelopment 2003).

Dallas has some extra-jurisdictional controls and agreements in place that affect growth management. As with any home rule city in Texas, Dallas has an extraterritorial jurisdiction (ETJ). Its population determines an ETJ distance of 5 miles, but the exact extent depends on the amount of unincorporated area around the city. In the southeastern corner of Dallas County there is still some unincorporated area where the city can exert its influence on development. The City of Dallas also has inter-jurisdictional agreements with Dallas, Rockwall, and Kaufman Counties regarding subdivision regulations and permits in its ETJ (Dallas City Council Meeting Minutes 2002). Annexation is not as contested an issue in Dallas as it currently is in neighboring Fort Worth, because Dallas did much of its annexation in the 1950s. According to the City of Dallas Planning Department, the city is mostly landlocked except for a small area in southeast Dallas

County. Much of this area lies in a floodplain, and the city does not consider it to be a major growth corridor. Neighboring cities have practiced strip annexations to block access by Dallas in this area. Dallas itself has used strip annexation to reach out to Lake Ray Hubbard, where some neighborhoods may eventually become part of Dallas. There is not an active annexation plan in place for this to occur however (Moore 2003).

5.2.2.2 Natural Resource Preservation Strategies and Facility Planning

5.2.2.2.a Land Preservation, Facility Planning, Facility Financing

Land preservation and banking does not receive very much attention in Dallas. The city developed a land bank of tax-foreclosed, seized, and city-owned surplus lots primarily for the purpose of affordable housing. The city maintains the lots. In the city's latest information, there are 43 lots in the land bank. Eligible participants are nonprofit organizations, with preference given to Community Housing Development Organizations (Land Bank Program 2003). Water protection receives slightly more attention, mostly through the water conservation ordinance in the city.

Facility planning is part of the Dallas Capital Improvement Program (CIP), with both general purpose and enterprise elements. The general purpose program provides improvements to and/or construction of the city's street system; parks and recreational facilities; police and fire protection facilities; flood protection and storm drainage systems; various city facilities; cultural facilities; and improvements to stimulate economic growth. Enterprise projects are for water and wastewater systems and projects that will increase revenue to the city, such as convention centers or air transportation facilities. Because the city has no future land-use map, coordination of capital improvements as a means to direct growth densities and intensities in various parts of the city is not relevant. The CIP is largely reacting to growth demand and, wherever it occurs or is needed.

Facility financing comes in a number of different ways, from bonds for the CIP to the special financing districts created by the city to public improvement districts (PIDs). PIDs are created at the request of the property owners within the district. Property owners pay a supplemental tax assessment that is used by the PID to provide services beyond those existing from the city. Each of the five Dallas PIDs develops its own program that may consist of area

image marketing, additional security, landscaping, lighting, street cleaning, and various cultural and recreational improvements (area redevelopment). These programs increase livability and the economic condition in the districts in which they are implemented.

5.2.2.3 Coordinating Processes, Plans, and Functional Assignments

5.2.2.3.a Comprehensive or Strategic Planning

Dallas does have planning within the city and outside the city government as well. Most of the planning done with the city is functional planning (e.g., parks and recreation master plans) and district planning for special project issues such as the downtown. Originating in 1992, the Dallas Plan is a privately funded nonprofit organization that produced a long-range plan for the city that was officially adopted in 1994. The plan was a 30-year vision for the city that is structured for implementation in sections. The Dallas Plan Web site publishes annual reports on which goals have been met and which are still pending, measuring implementation progress. Part of the plan includes provisions for "Smart Growth for a Sustainable Community." A symposium held in 2000 brought together a variety of expert speakers, business leaders, city officials, developers, architects, design professionals, stakeholder organization representatives, and interested community members (Smart Growth for a Sustainable Community 2001).

The most recent progress report on smart growth in the plan focuses on renovation and infill development. Retaining the integrity of the city center through infill and brownfield redevelopment has been the focus of the land-use based growth-management strategies in the North Central Texas area. The development of mass transit options to connect the downtowns to the surrounding cities and suburbs forms the center of the transportation program (Dallas Plan 2002).

5.2.2.3.b Regional Planning Council

The NCTCOG has a 5-year strategic plan that it updates on a regular basis that identifies over thirty issues where the region can be strengthened. Of importance to this report are the following areas: development and environmental services, regional information infrastructure, and transportation. Its stated vision of success:

"enhances the built environment, reduces vehicle miles of travel (VMT), uses water & energy resources effectively and efficiently, and helps advance environmental stewardship in order to ensure continued economic vitality and provide the highest attainable quality of life for all residents." (Strategic Plan for 2003-2007).

The development of the Center of Development Excellence is a part of how it intends to achieve these goals. The Center of Development Excellence brings together private- and public-sector experts in the environmental, transportation, development, and information analysis fields to address regional issues and infrastructure concerns for the future. The Center has developed "10 Principles of Development Excellence" as a guide to what can be done with new development to handle transportation, air quality, water supply, and environmental concerns.

5.2.3 Smart-Growth Matrix Application

After seeing the new growth in the suburbs and satellite cities, Dallas made a commitment to improve the city to attract and retain residents and businesses. By evaluating what made the city unattractive, several successful programs were developed to address traffic congestion, lack of residential opportunity in the downtown, infrastructure in need of repair, and the number of vacant and brownfield sites within the city. Many of these programs have been around long enough to have established successes. For example, most of the strategies in use in downtown Dallas, such as infill, brownfield, and transit-oriented development work very well together as they increase the density and variety of land uses as well as modal split. Most office relocations in the downtown area are within walking distance of a DART station, according to DART. Downtown residential development must reach a critical mass to support mixed-use developments, and many believe this has already happened. Many of the development strategies also work with the available financing districts to bring development to historically undervalued areas and ensure a mix of income levels in residential developments.

Application of the smart growth matrices to the Dallas context reveals several other policy choices that might help Dallas go further in meeting its goals. Based on the transportation suitability and characteristics matrices, which take into account the city's political culture, home rule status, growth rate, congestion, and emphasis on market and investment administrative approaches as key criteria to filter choices (based on the research team's assessment of what

would matter most to Dallas), there are twelve possible transportation policy actions currently not being used to promote Dallas smart growth goals. These include:

1. Jobs Housing Balance Programs
2. Gasoline Tax Increase
3. Road Pricing: HOT lanes
4. Congestion Pricing: Area Wide or Cordon Pricing
5. Congestion Pricing: AVI
6. Distance-Based Taxes
7. Alternative Roadway Design Standards
8. Transportation Enhancement Program
9. Monetary Incentives for Alternative-Mode Use
10. Worksite Parking Management
11. Location Efficient Mortgages
12. Fix It First Strategies

Among these twelve policy actions, the effectiveness matrix suggests that the congestion-pricing alternatives will be the most effective policy actions to pursue to reduce VMT and manage congestion, while transportation enhancements, alternative roadway design standards (such as context sensitive design and enhanced connectivity), location efficient montages (which might be explored with area banks and lenders), and monetary incentives for alternative-mode use might be somewhat or very effective in providing more transportation choices. There were few transportation strategies and policy actions that Dallas could pursue that are not already in place to promote economic vitality and strengthen community livability (with the sole exception of fix it first programs, which were rated as somewhat effective by the panel reviewers).

There are, however, additional growth-management policy action choices that Dallas could pursue to better promote economic development and strengthen community livability goals. These were found by applying the suitability and characteristics matrices to the Dallas context. Among the fifty-nine possible growth-management policy actions, the matrices identified eight policy actions currently not in use that might help Dallas further its smart growth goals. These include:

1. Priority Funding Areas
2. Split Rate Property Tax
3. Transferable Development Rights
4. Purchase of Development Rights
5. Conservation Easements
6. Farmland Preservation Credits
7. Differential Assessment Programs
8. Streamlined Permitting Processes

Applying the effectiveness matrix to these growth-management policy choices, we find that priority funding areas, split rate property taxation, transfer of development rights, purchase of development rights, conservation easements, streamlined development permitting, and farmland development credits are all likely to be somewhat or very effective in promoting economic vitality and strengthening community livability. The next step for Dallas or a TxDOT regional office working with Dallas and its metropolitan planning organization (MPO) would be to consult the glossary descriptions of the transportation and growth-management actions in the appendix of this report to gain a better understanding of the tools (if they are not already familiar with them) as they might apply in the Dallas area, and to explore the use of these tools in greater depth in Texas and the nation by using the literature review sources to learn more (provided in appendix and CD-ROMs). It would also be useful to evaluate whether some of the existing strategies and tools that are already in place are being used to their full potential. For example, although Dallas does some limited land banking and open space acquisition, this might be better used, upon further investigation, to strengthen livability and stimulate economic vitality. Finally, should a list of policy choices seem too narrow, a community could consider relaxing some of their suitability factors such as a greater openness to some of the more "planning oriented" approaches that would afford more strategies and policy choices to promote their desired goals.

5.3 CASE TWO: PORTLAND METRO

5.3.1 Introduction

The Portland Metro (metro) region in Oregon is quite possibly the most commonly cited exemplar of successful coordination of transportation and growth-management planning and

policymaking to mitigate sprawl in the entire U.S. The region, with active participation from citizens, environmentalists, and government officials, has been addressing sprawl concerns since the early 1960s, and through sustained perseverance, achieved exemplary success. Metro was one of the first regions in the nation to adopt an urban growth boundary (UGB) as a growth management tool and has managed to shift a very large percentage of trips in the urban core to light rail and other modes of travel in conjunction with other service providers.

Understanding the Portland region's transportation and growth-management system requires some background on the state's growth-management program, which frames the regional and local efforts to avoid and mitigate sprawl. Initial growth-management efforts in Oregon date back to the post-World War II era, when the region experienced a spurt of development activity, with little regard to its impact on the natural resources and landscape. Citizen concern about the growing urban sprawl led to legislative action in 1969 when the legislature passed Senate Bill 10, requiring cities and counties in the state to prepare comprehensive land-use plans that adhered to ten statewide planning goals. In 1973, Senate Bill 10 was strengthened through Senate Bill 100, and Oregon added four more statewide goals to the state planning agenda. By December 1976, Oregon had nineteen statewide goals, which form the underlying basis for the entire transportation and land-use planning for all regional and local agencies. Oregon does not have a state plan or a comprehensive plan, but the statewide goals form the foundation of all planning actions throughout the state. These nineteen goals, often referred to by their number, are as follows:

Goal 1: Citizen Involvement
Goal 2: Land-Use Planning
Goal 3: Agricultural Land
Goal 4: Forest Lands
Goal 5: Open Spaces, Scenic and Historical Areas, and Natural Resources
Goal 6: Air, Water, and Land Resources Quality
Goal 7: Areas Subject to Natural Disaster and Hazards
Goal 8: Recreational Needs
Goal 9: Economy of the State
Goal 10: Housing
Goal 11: Public Facilities and Services

Goal 12: Transportation

Goal 13: Energy Conservation

Goal 14: Urbanization

Goal 15: Willamette River Greenway

Goal 16: Estuarine Resources

Goal 17: Coastal Shore lands

Goal 18: Beaches and Dunes

Goal 19: Ocean Resources

Oregon's Land Conservation and Development Commission (LCDC) is the lead agency for direct implementation of these goals across all state, regional, and local levels of government. The LCDC is supported by the staff at the Department of Land Conservation and Development (DLCD). The LCDC implements the goals and administrative rules consistent with the intent set forth by the legislature for growth management and mitigation of sprawl. Local governments (counties and cities) have to incorporate state goal concerns in their comprehensive plans. The DLCD and Oregon Department of Transportation (ODOT) are two key state agencies that work together toward effective growth management through land-use and transportation programs.

It took several decades of sustained efforts for the planning system to evolve and mature in the state. Through constant monitoring, required policy changes were introduced and new programs and new agencies were created and charged with mitigating sprawl throughout the state and helping to create walkable, livable, and pleasant built environments. Growth boundaries were adopted to steer growth away from prime agricultural lands, productive forestry lands, and environmentally sensitive zones. The governor and legislature were clear leaders in making these concerns a statewide priority.

By the late 1980s, the need for integrated transportation and land-use planning to manage sprawl was clearly perceived by the state and its leaders, and they took measures to guide the cities and counties for a holistic approach in their region. This came about in the wake of the 1987 Metropolitan Service District (MSD) report, recommending that the Regional Transportation Plan (RTP) include a new highway corridor to solve transportation problems in western Washington County. The proposed bypass raised several issues related to land use and transportation goals, especially because it crossed over Metro's UGB. The organizations, 1000 Friends of Oregon and Sensible Transportation Options for People (STOP), challenged the

highway, and while the state land-use arbitration board was sorting out the legal matters, ODOT and Washington County sought guidance from the DLCD.

As a result a state rule-making process was initiated called the Transportation Planning Rule (TPR). TPR was adopted by the LCDC in 1991 after strong opposition to the Portland highway project. TPR requires state, regional, and local jurisdictions to develop and coordinate on the state Transportation System Plan (TSP). These arise from the state Goals 11 and 12 (Public Facilities and Transportation, respectively). The Oregon Transportation Plan (OTP) serves as the state's TSP. In 1991, the DLCD also created the Urban Growth Management Task Group on Development Inside Urban Growth Boundaries (UGM Task Group) to help local jurisdictions strengthen their growth-management strategies.

In 1993, DLCD and ODOT jointly established the Transportation and Growth Management (TGM) Program with the help of the UGM Task Force to produce educational materials on urban growth-management policies for the local governments. The program is supported by state general funds and federal funds under the Federal Transportation Equity Act for the 21st Century (TEA-21). The program's mission is to enhance Oregon's livability, foster integrated land-use and transportation planning, and encourage development that results in compact, pedestrian-, bicycle-, and transit-friendly communities. TGM also provides funding to a variety of TGM projects to introduce local policy makers to the workings and benefits of the policy tools recommended by the UGM Task Group. This is an effort at the state level to guide local governments in growth management by introducing policy tools for specific problems in order to achieve the desired urban form and meet the nineteen statewide goals. There are several aspects of the TGM program, from providing project funding to setting design standards for projects. It offers planning *grants* to local governments, through which livable, transportation-efficient communities that make the best use of state highway infrastructure can be planned. TGM's *Quick Response Team* consultants provide transportation-efficient design alternatives to development proposals. On request, a team helps a community or developer meet *Smart Development* design objectives. *Code Assistance* is provided to local governments to prepare or amend development codes for transportation system and land-use plans, and apply urban growth management tools. The TGM *Outreach* program is aimed at increasing the understanding and acceptance of smart development principles through initiatives like workshops, a partnership

program and technical assistance for practitioners (ODOT/DLCD Transportation and Growth Management Program 2003).

By 1995, several problems in the Oregon growth-management system were identified that the cities and counties were trying to mitigate. In an effort to guide their progress, the TGM program published a handbook of policy tools called Oregon TGM Tools of the Trade. The tools respond to problems with development observed inside the urban growth boundaries, such as:

- Development at lower than planned densities
- Dispersed development in urbanizable areas
- Inconsistent system development charges, impact fees, and exactions across jurisdictions
- Overburdened public facilities and development in areas not fully served
- Development designs that discourage future infill or redevelopment at higher intensities
- A lack of infill and redevelopment in older urban areas

5.3.2 Background

The Portland MSA region experienced rapid population growth in the 1990s, with growth rates exceeding the national average. While UGB did contain growth within the region, the City of Portland still lost population share relative to outlying cities. By the year 2020, the population of the Portland metropolitan region, including Clark County of Washington is predicted to be 2.3 million people, an increase of 51% from 1994. Employment is expected to increase by 70%, raising the total number of jobs to 1.6 million (Portland Metro 2002). Metro is the federally mandated MPO designated by the governor through the Joint Policy Advisory Committee on Transportation (JPACT) responsible for the allocation of federal transportation funds to projects in the region under Intermodal Surface Transportation Efficiency Act (ISTEA) and TEA-21. Metro is the only directly elected regional government in the country, serving about 1.5 million people in the twenty-four cities and three counties of Clackamas, Multnomah, and Washington of the Portland Metropolitan region. This is almost half the population of the state of Oregon.

In 1990, the legislature referred a constitutional amendment to Oregon voters to allow the creation of a home-rule charter for regional governments. The home-rule charter was approved in 1992, and amendments were approved by Metro voters in 2000. According to the charter, Metro's primary responsibility is regional land use, transportation planning, and the operation of solid waste disposal system. Metro has already achieved exemplary success in achieving landmark integration between land use and transportation. Its other duties include operation of regional facilities such as Metro Zoo, the Oregon Convention Center, and other trade and spectator buildings; acquisition and management of a system of parks and open spaces; planning and response coordination for natural disasters; natural resources planning; and development and marketing of data. The creation of Metro basically combined metro services and growth management efforts.

The Metro Council is the governing body of Portland Metro. Initially Metro had a seven-member council, with an executive officer and an auditor. Amendments in 2000 consolidated the executive and council offices. Its structure now includes a council president, an auditor and six councilors (each from a different district). The Metro Council makes the same kinds of policy actions as any home rule city: it passes ordinances and resolutions. Ordinances create laws that legally obligate Metro (and in some cases cities and special districts within the region). There are two types of resolutions: some that state policy views and are not legally binding and others that authorize specific actions by Metro officials.

The Joint Policy Advisory Committee on Transportation (JPACT) is the advisory body to Metro. It is composed of elected local government officials and representatives of transport supply agencies. The seventeen-member committee is composed of three members of the Metro Council; a commissioner from the City of Portland; a county commissioner from each of the three counties; an elected official from each county representing cities; one representative each from ODOT, Tri-Met, Port of Portland, Oregon Department of Environmental Quality, and Washington DOT; an elected representative from Vancouver and one from Clark County (Washington); and an alternate representative from C-Tran (the public transit system in Clark County, Washington). JPACT recommends priorities and develops the transportation plan, which is forwarded to the Metro Council. The Metro Council must adopt JPACT recommendations

before they become transportation policies. The Transportation Policy Alternatives Committee (TPAC) provides technical input to JPACT to help in making recommendations. TPAC's membership includes technical staff from the same governments and agencies as JPACT, plus representatives of the FHWA and Southwest Washington Regional Transportation Council. It also has six citizen representatives appointed by the Metro Council.

Metro follows a well-structured process for the regional planning process. The root of Metro's efforts for transportation and land-use planning, and indeed for all other initiatives, lays in the **Future Vision**. This, as the name suggests, is a vision for the future of the region — how the people want their region to develop, what is the preferred regional development pattern, what areas are to be protected? It is a reflection of the region's values and aspirations. From the Future Vision emerges the **2040 Growth Concept**. The 2040 Growth Concept is the regional comprehensive plan that will help create the Future Vision and includes a future land-use map of the region. Adopted in 1995, it guides how the urban growth boundary is managed to protect the community characteristics valued by the people who live here. It assumes that up to 28.5% of new housing in the region will result from infill and redevelopment projects. The 2040 Growth Concept, which shows the future land uses:

- Encourages efficient land use, directing most development to existing urban centers and along existing major transportation corridors.
- Promotes a balanced transportation system within the region that accommodates a variety of transportation options such as bicycles, walking, mass transit, and cars.
- Supports the region's goal of building complete communities by providing jobs and shopping close to where people live.

The 2040 Growth Concept thus interprets the region's future vision in more concrete terms and translates it into physical form. It is achieved through implementation of eight fundamental values:

1. encourage efficient use of land,
2. protect and restore natural environment,
3. provide balanced transportation system,
4. maintain separation between Metro UGB and neighboring cities,

5. enable communities inside the Metro UGB to preserve physical sense of place,
6. ensure diverse housing options for all residents,
7. create a vibrant place to live and work; and
8. encourage strong local economy

These fundamentals, in turn form the basis of the *Regional Framework Plan* (RFP), which is the implementation program for the 2040 Growth Concept, or the 2040 Plan. It lays down policies and regulations to achieve the desired urban form by 2040. Metro adopts the regional framework plan after consultation and guidance from the Metropolitan Policy Advisory Committee (MPAC). The RFP addresses the following issues: (1) regional transportation and mass transit systems; (2) management and amendment of the urban growth boundary; (3) protection of lands outside the urban growth boundary for natural resource, future urban, or other uses; (4) housing densities, (5) urban design and settlement patterns; (6) parks, open spaces, and recreational facilities; (7) water sources and storage; (8) coordination, to the extent feasible, of Metro growth-management and land-use planning policies with those of Clark County, Washington; and (9) planning responsibilities mandated by state law.

The REP also addresses other growth-management and land use planning matters that the Metro Council, with the consultation and advice of MPAC, determines are of metropolitan concern and will benefit from regional planning. To encourage regional uniformity, the regional framework plan contains model terminology, standards, and procedures for local land-use decision making that may be adopted by local governments. The RFP is subject to compliance acknowledgment from the LCDC. While the Metro provides regional co-ordination and sets policies for counties and cities, it is the local governments themselves that provide planning functions such as zoning, permitting and transportation access, and neighborhood design. *Comprehensive plans* are prepared by the local governments, which must adhere to the policies set by Metro and the state.

The following diagram explains the layering approach of this system and shows the key concepts of the framework of regional planning followed by Metro.

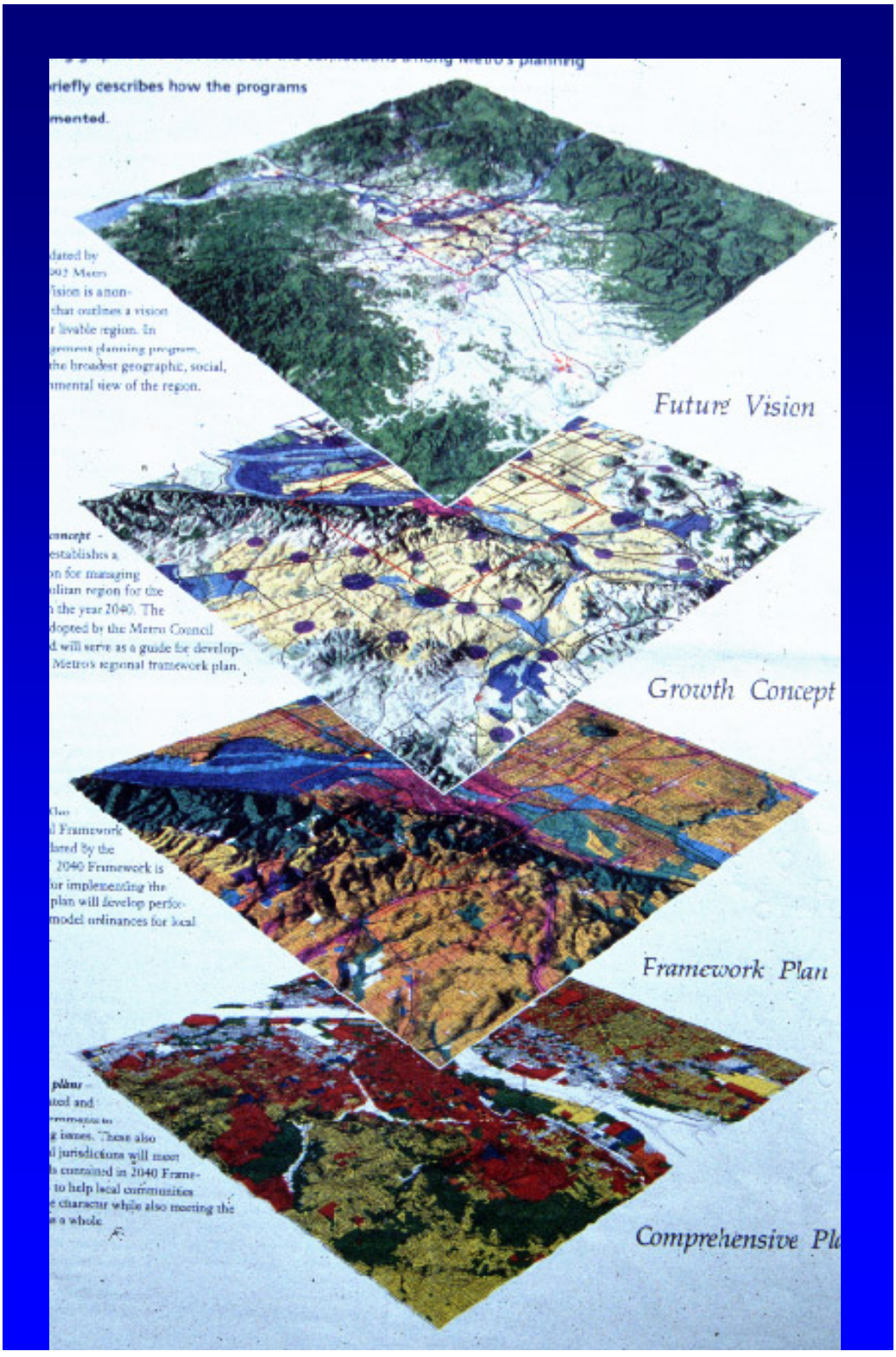

Figure 4 Metro's Key Concepts[i]

In accordance with the state requirement of a transportation system plan, Metro has also adopted the Regional Transportation Program (RTP) to manage its transportation planning. For preservation of open space and forest and farm lands, Metro implements the Green Space Management Plan. Growth management, transportation planning, and green space conservation are the main targets of Metro's efforts. It is noted that in Oregon, zoning and other forms of land-use regulation must implement the local comprehensive plan.

One of the chief aspects of the 2040 plan is to protect established single-family neighborhoods by focusing new growth in town and regional centers and along transit corridors. This includes policy actions like:

- increasing densities and specifying minimum residential densities near transit lines and near large employment and retail shopping areas;
- increasing densities in new office and retail projects; mixing residential and neighborhood commercial land uses;
- designating land uses to achieve a closer balance between jobs and housing; and
- setting maximum parking limits at office and institutional developments, which shrink the supply of available parking.

Metro's system of growth management is not designed with a view to limiting growth, but rather to supervise the growth process in the metropolitan region. Metro has several strategies and policy tools for effective growth management and creation of livable, pedestrian-friendly, and safe communities. What sets Metro's growth-management approach apart from other efforts is its unique combination of land-use and transportation strategies. Metro identifies the two issues as being inseparable and has designed tools for growth management that deal with the two aspects simultaneously. A number of these tools have been identified in the TGM handbook, Oregon Tools of the Trade (available online at: http://www.lcd.state.or.us/tgm/pub/tools.htm).

5.3.3 Main Transportation-Planning Mechanisms within Metro

5.3.3.1 Transportation Planning Rule (TPR)

The TPR of the state, in accordance with State Goal 12 (transportation), requires local governments to prepare a TSP that addresses the state transportation and land-use goals. The statewide transportation projects, in turn, have to be compatible with acknowledged comprehensive plans. Mass transit, transportation, airport, and port districts participate in system planning processes and make their own plans. The Oregon Transportation Plan (OTP) serves as the state's TSP. The TPR is based on the two-way relationship between land use and transportation: the character of the transportation system influences the density and location of urban development, while density and location of housing and commercial development help to determine the viability of different kinds of transportation systems. The local transportation plans have to consider all modes of transportation that offer rationales for housing initiatives as well as facilitating the flow of goods and services to strengthen the local and regional economy.

According to the TPR, the local governments have to achieve a 20% reduction in VMT by 2030 and 10% reduction in parking spaces by 2020. Interim benchmarks need to be established by local planners for all goals, and need to be reviewed every 5 years. The local comprehensive plans must be amended if they do not achieve the specified interim standards. Cervero, as cited by Carl Abbott, stated four basic planning tools as transportation-efficient land-use strategies. These include increased density, mixed land use, job/housing balance and pedestrian oriented site designs. Oregon state, through its TPR and Metro, encourages local governments to implement these strategies. TPR requires MPOs to complete their transportation plans in 4 years, and local governments within MPOs to implement their TSPs within 1 year of that.

5.3.3.2 Regional Transportation Plan (RTP)

The RTP identifies projects for transportation investments. Adopted by Metro in August 2000 and updated every 3 years, this is the regional TSP for 2020. It identifies a 20-year list of future transportation projects based on regional transportation and land-use policies that implement the 2040 Plan and the RFP. The goal of the plan is to expand choices of travel in the

region, and protect the livability of the region in the face of the projected population and job growth by 2020. The plan sets policies for multimodal travel other than driving, like bus, light rail, walking, and bicycling and movement of freight by air, rail, truck, and water. It establishes where the major transit capital improvements will be located. The RTP 2000 recommends more than 650 projects with an estimated cost of $7.6 billion. The Bi-State Transportation Committee advises Metro on regional transportation goals pertaining to both the state of Washington and Oregon in the Portland/Vancouver area.

5.3.3.3 Tri-County Metropolitan Transportation District (Tri-Met)

TriMet offers transportation services to the three counties of Clackamas, Multnomah and Washington. Its role as the primary transportation provider is to design and construct the improvements outlined in the RTP. It is a unified suburban and city transit line service that implements the Metro Transportation Improvement Program (MTIP). This includes operation of the bus services and a 33-mile MAX (Metropolitan Area Express) light rail system. It is a highly successful service with a 12-month average daily ridership of 71,200 boardings, and 84,000 average rides on weekends. Buses average 209,700 weekday boardings (as of September 2001). Since July 2001, Tri-Met has also run a 2.1 mile Central City Street Car, developed expressly as a tool to leverage more inner-city housing. Portland Metropolitan region also has other public transit operators like South Metro Area Rapid Transit (SMART) in Wilsonville and C-Tran in Clark County.

5.3.4 What's in Place? Transportation-Related Strategies and Policy Actions

Metro employs a number of the strategies and policy tools identified in the literature review. It is particularly active in the use of transportation-based, efficient land-use planning, alternative-mode support strategies and worksite-based strategies. Over the years, Metro has also realized the need to incorporate more policy tools for effective traffic congestion such as pricing strategies and objective-based strategies. Several additional strategies and tools are under development, but not yet adopted by Metro and its partner service providers.

5.3.4.1 Transportation-Efficient Land-Use Planning and Development Strategies

Metro's aggressive strategy of linking transportation and land use is very supportive of transportation oriented development (TOD), as is evident in the adoption of tools such as minimum density zoning, prohibition of auto-oriented uses, parking maximums/caps especially in town centers and transit corridors. Property tax abatement is also often used as a tool for encouraging TOD. The Oregon Legislature enabled a 10-year property tax abatement for TOD in 1995. Metro's TOD is the Implementation Program, which executes projects such as transit corridors that concentrate a mix of retail, housing, and jobs in areas around regional light rail systems and other transit lines. Metro also runs the Transportation Demand Management (TDM) program, which establishes parking management policies to assist local jurisdictions in implementing the voluntary parking ratio program (which helps address ozone nonattainment issues as well). The regional parking management policies establish minimum and maximum parking ratios to manage the number of off-street parking spaces. They promote the use of shared parking spaces for commercial and retail land uses, and are often focused on town and city centers with a mix of land uses.

5.3.4.2 Alternate-Mode Support Strategies

The RTP sets goals and objectives for the transportation system to meet the 2040 Growth Concept. One of the most important objectives is to provide more options for public transportation to reduce SOV auto use through better use of the regional transit network. Implementing Tri-Met's Transit Choices for Livability community transit plan and expanding transit service to the mobility impaired is a part of this effort. Metro's TDM Program is an element of the RTP that provides alternatives to driving alone and helps enhance mobility through improving regional accessibility to public transportation. The region's TDM policies support funding for alternate transportation modes like bicycle, pedestrian, and public transit systems, and respond to the federal Clean Air Act requirements of 1990, the state TPR, and the state Employee Commute Options Rule. Metro's regional transit network includes six forms of travel-light rail, commuter rail, rapid bus, streetcar, frequent bus, and regional bus service. Future service may include new forms such as minibuses and van pools to facilitate custom transit service. Metro also has a community transit network and an interurban public transportation service. To make public transportation faster and more efficient, many modes

include facilities like transit preferential treatments and enhanced passenger amenities along the corridor. Transit preferential treatments include bus-only lanes, signal preemption, closer bus stops and more direct transit routes, and enhanced passenger amenities including covered shelters, benches and electronic displays of bus arrival times. These work as effective tools to enhance alternate transport modes. Availability of information to the public, improving public transportation to make it more environmentally friendly and safe, and providing competitive travel times compared to the automobile are some other goals of the RTP. The RTP requires that travel time for light rail and rapid bus routes during peak hours should be no slower than 150% of the auto travel time during off-peak hours. Similarly, total transit travel time for trips on regional bus routes should be no slower than 200% of the total auto travel time.

5.3.4.3 Worksite-Based Strategies

Among other initiatives, TDM promotes private and public sector programs and services that encourage employees to use non-SOV modes or change commuting patterns, such as telecommuting, flexible work hours, and/or compressed workweeks. It also promotes facilities that support alternative transportation, such as showers and lockers at employment centers for employees who bicycle to work. Private corporate agencies also play an important role in encouraging alternate-mode use and reducing auto uses. For example, Intel in Portland gives all of its 11,500 employees an annual pass. TDM sets non-SOV mode split targets for the different design types for 2040 so as to achieve per capita travel reductions required by the state TPR. For the central city, the non-SOV mode split target is 60-70%; for regional centers, town centers, main streets, station communities, and corridors, it is 45-55%; and for industrial areas, intermodal facilities, employment areas, and inner and outer neighborhoods, it is set at 40-45%.

5.3.4.4 Pricing Strategies

Metro's TDM program is currently considering tools such as peak-period pricing for management and optimization of the use of highways and reduction of congestion. According to the Texas Transportation Institute (TTI), traffic congestion will continue to grow despite all measures to minimize it. Metro is considering strategies for congestion such as HOV lanes, toll lanes, congestion pricing, and offering more travel options. Better traffic management and management of traffic disruptions such as crashes and breakdowns is another focus for new

policies. One of the main indicators for traffic congestion is street connectivity. A well-connected street system disperses longer distance trips onto the arterial system, designed for higher speeds and less access to property, and shorter distance trips are handled by the connected system of local and collector streets. With this in mind, all jurisdictions in Metro require 10 to 16 street connections per linear mile in new developments. This reduces delay on the regional system by up to 19 % and delay on arterial traffic by up to 12 %.

5.3.4.5 Objective-Based Strategies

Another strategy under consideration is "location-efficient mortgage" for increasing the borrowing power of potential homebuyers in "location-efficient" neighborhoods. These are pedestrian-friendly neighborhoods with easy access to public transit, shopping, schools, etc. The other efforts of Metro for efficient land use through transportation policies include the Regional Travel Options (RTO) Program and Livable Streets Program. The RTO program aims to provide alternatives to driving alone, including: carpooling, vanpooling, riding the bus, telework, work schedule changes, MAX or streetcar, and walking and biking. The RTO is coordinated with many entities including Tri-Met, Oregon Department of Environmental Quality, Oregon Office of Energy, SMART, and TMAs. The Livable Streets program explains how street systems can be designed to reduce storm water runoff and impact from stream crossings.

5.3.4.6 Coordination and Integration

With adoption of the RTP in August 2000, local governments in the Metro region get a year to update their local plans to reflect the new regional policies. This is a tremendous tool to leverage transportation and land-use goals. Programs like TOD and TDM are implemented at the regional level, which ensures integration of transportation systems and land-use planning principles on a regional basis (and requires local coordination among the various agencies). The tools are used regionwide, though the actual numbers, like parking ratios, may vary within. However, goals are established and limits are set for the entire region, aimed at achieving the meaningful urban form as outlined in the 2040 Growth Concept. The state also plays an important role in achieving smart growth goals by identifying potential tools for effective regional and local planning. The Transportation and Growth Management Program (TGM) of

ODOT and DLCD gives guidelines on various transportation and land-use tools for growth management.

5.3.5 What's in Place? Growth Management-Related Strategies and Policy Actions

The policy actions mentioned in the TGM handbook, Oregon Tools of the Trade, are grouped into three categories: land use strategies, intergovernmental agreements, and public facilities techniques. The land-use strategies address issues of less-than-planned densities, dispersed development within the UGB, inefficient land uses, difficulty in transitioning from rural to suburban to urban levels of development, etc. The intergovernmental agreements deal with solving problems that arise because of lack of coordination among various agencies and fragmented decision-making processes. Public facilities techniques address issues of patterns of development and level of services provided. Metro uses several of these tools for its growth management depending on the local context and need.

5.3.5.1 Urban Growth Containment Strategies

One of the first tools adopted by Metro for containment of urban growth and prevention of sprawl was the *Urban Growth Boundary (UGB).* With active involvement from 1000 Friends of Oregon, citizen participation, environmentalists, and several other stakeholders, Metro adopted its first UGB in 1979. This is the edge than separates the urban land from the rural land and open natural landscape (see Appendix 5 for map of the Metro UGB). By requirement, the UGB must contain land that would be needed to absorb the projected population and jobs for the next 20 years. The Metro UGB contains about 368 sq. miles or 235,904 acres (December 2002), and about 1.3 million residents (Census 2000). It is reviewed every 5 years, and updated or expanded if need is adequately demonstrated. Land has been added to the original UGB several times since 1979, though most of it was not very significant. Major additions were made in 1998 and 2002, when about 3,527 acres and 18,638 acres were added, respectively. In order to achieve affordable housing objectives in the Portland UGB, the plan densities were higher than required for UGB justification.

Deciding the urban growth boundary and maintaining it can be a contentious issue, since it has several implications in the region as a growth-management tool. Areas of contention include (1) the urban value gap (a gap in land prices/value of urban relative to rural land — often urban land prices rise while rural land values fall; and (2) affordable housing concerns as prices

of land for housing inside the UGB rises. However, housing prices need not necessarily rise too. If high-density, mixed-use, and multifamily housing are encouraged through zoning and other requirements, then housing prices may not rise. Besides these, there are effects on farmland preservation and urban form. All these issues depend on the formulation and management of the UGB policies. Construction of the UGB is a difficult task because too little land can cause land price inflation, while too much land may not effectively prevent urban sprawl.

5.3.5.1.a Infill, Redevelopment and Zoning

Infill and redevelopment strategies identify and implement policies that improve market opportunities, and reduce impediments to development in areas suitable for infill or redevelopment. These are policies that change regulations to reduce barriers and provide incentives for infill development. They also help improve the market for higher-density development. Reducing supply of developable land in fringe areas helps encourage infill development through the land market. Minimum density zoning, another tool for infill and redevelopment, amends plans and zoning ordinances to include minimum as well as maximum allowable densities. This ensures that development occurs at densities that are consistent with land use and transportation plans. Minimum and maximum densities may be specified for single family and multifamily residential zones, which can encourage efficient use of land and transit services. By reducing obstacles to higher-density developments, the urban form can change. However, local governments must be aware that the specified density should reflect the market and should be consistently applied to all residential zones in a jurisdiction for a stronger impact. Interim development policies and standards are applied to facilitate future development of fringe areas at planned densities. This policy tool is particularly effective in encouraging development in areas where neighborhood opposition, fragmented ownership, parcel sizes, and building locations have inhibited development. Transportation-efficient land-use strategies such as mixed-use zoning are also encouraged and commented on in local plan amendments to encourage pedestrian, bike, and transit travel rather than automobile. These policies encourage neighborhood parks and shops, and enhance civic spaces and centers. They also provide for interconnected, pedestrian-scaled street networks, and encourage transit-supportive development.

5.3.5.1.b Urban Growth Management Agreements (UGMAs)

UGMAs establish procedures for coordination between cities and counties to identify a lead jurisdiction for growth management inside urban growth areas. The agreements define lead responsibility for planning, zoning, and urban service extension within these areas. Oregon's statewide planning laws establish a structure where at least two jurisdictions (a city and county) have responsibilities for and will interact on growth-management issues. Besides UGMAs, interagency coordination is enhanced through workshops, conferences, joint work sessions, establishment of task forces, memorandum of understanding, or other conventional modes of communication.

5.3.5.2 Natural Resource Preservation Strategies

Metro has a comprehensive natural resource planning program, which is aimed at protecting air and water resources, providing access to parks and natural areas, and sustaining and enhancing fish and wildlife species and habitat. The Greenspaces Master Plan Update identifies a cooperative regional system of parks, natural areas, greenways, and trails. The federal Endangered Species Act guides Metro's natural resources protection strategies. Metro also implements a Water Quality and Floodplain Protection Plan, which provides regionwide protection measures for water quality and floodplain management.

5.3.5.2.a Land Acquisition and Floodplain/Water Quality Protection

Land acquisition is an important part of the program for preservation of open green space. The Open Spaces Program purchases natural areas, trails, and greenways to be held for future use as parks, trails, and fish and wildlife habitat. Metro's RTP calls for a 350-mile regional trail and greenway system that links natural areas and provides access to nature. Currently, Metro is in the process of acquiring property in fourteen regional natural areas and six regional trails and greenway projects. In addition, about 100 local park projects throughout the region are being funded from the "local share" portion ($25 million) of the $135.6 million open spaces, parks, and streams bond measure approved in 1995. Metro's portion of the bond measure is being used to acquire future regional park sites, natural areas, trail corridors, and greenways. Under the same bond measure, Metro and local communities have purchased more than 8,000 acres of open spaces for neighborhood parks and wild spaces — a good 2,000 more acres than originally promised. As of July 15, 2003, Metro had acquired more than 7,935 acres of land for

regional natural areas and regional trails and greenways, in 251 separate property transactions. These properties protect 70 miles of stream and river frontage. (These numbers include Metro's local share purchase.)

Metro's Water Quality and Floodplain Protection Plan has been in effect since June 1998. It requires local jurisdictions to meet specific, quantifiable regional performance standards relating to water quality and floodplain management. The performance measures for water quality include protection of vegetation along rivers, streams, and wetlands; prevention of soil erosion and loose soil muddying streams; and prevention of uncontained uses of hazardous materials along rivers and streams. Performance measures for floodplain management include limited development in the floodplains of the region's rivers and streams, and they require balanced cut and fill. Its Livable Streets program explains how street systems can be designed to reduce storm water runoff and impact from stream crossings. Metro and its local partners have identified policy tools to assist local governments in their efforts to protect stream corridors and floodplains. These tools include:

- *Density transfers* to allow higher density on areas outside the water quality and floodplain protection areas in order to avoid development on areas adjacent to waterways or in floodplains.
- Variance provisions to avoid any parcel being considered unbuildable through application of the *overlay zone***.**
- *Conservation easements* that protect resources in the water quality and floodplain protection areas.
- A water quality and *floodplain protection map* that provides valuable natural resource information to guide future development.

5.3.5.3 Facility Adequacy and Services Strategies

These tools deal with problems that arise owing to a gap between development and provision of infrastructural services.

5.3.5.3.a Urban Service Agreements, APFRs, CIP

Urban Service Agreements identify who (city, county, or special district) will provide each urban service such as sanitary sewers, water, fire protection, parks, open space, recreation, streets, roads, and mass transit. They determine the future service areas for each provider, and assign various roles and responsibilities. They also address issues of financial and operational capacity of each service provider. It eliminates duplicative service provision that may be counter-productive to efficient service provision. Metro coordinates these service agreements to be consistent with the UGB. Metro encourages adequate public facilities requirements (APFRs) so that adequate levels of public services (e.g., roads, sewer, water, drainage, parks, etc.) are met as a condition of new development. This tool is typically enforced by local governments, providing more control over the timing and location of new development projects. *Focused Public Investment Plan (FPIP)* focuses public investments in specific areas, making developers responsible for providing services outside the investment zones areas. An FPIP delineates the location, timing, and capacity of planned public facilities improvements to be consistent with the future land-use and transportation plans. It is similar to a capital improvements program (CIP) except that it identifies specific areas called public investment areas (PIAs) where improvements will be focused. When new projects are proposed the local government may provide all off-site public facilities, but the developer would have to hook onto those services and provide extensions to them on-site. These reduce the cost of extending urban services, yet result in *fully served development.*

5.3.5.4 Coordination and Integration of Processes and Plans

5.3.5.4.a Annexation, Specific Development Plans, and Regional Service Standards

Annexation plans identify areas to annex for voter approval, timing of annexation, needed urban services, and effects of annexation on current service providers. The Oregon legislature made annexation an effective growth-management tool by allowing local governments to set a date of annexation of up to 10 years in the future. The key to annexation plans is a coordinated effort between service providers that focuses on sorting out fiscal and territorial issues. One of the direct impact of annexation plans is that they encourage design and development of long-term master plans. Annexation plans also address the economic viability of special districts.

Metro works with land owners, developers, and neighbors to develop a detailed site plan for specific development plans of an area. It allows for more innovation in design and organization of land uses. They may set design standards depending upon the zoning ordinance. Such plans require a consensus-based development process so as to achieve more cohesive development within an area. *Regional urban service standards* are minimum standards for urban services in developing areas of a region providing interim rural service designs that facilitate future integration into the urban system. The standards address how neighboring systems interconnect and thus foster cooperation among service providers. Oregon's legislature requires adoption of two types of agreements, cooperative agreements and urban service agreements between each city, county and service district for efficient provision and coordination of urban services within an UGB. Cooperative agreements must establish roles and responsibilities of each city, county and special district in the area with respect to new developments and planning activities. Urban service agreements deal specifically with issues of service delivery.

5.3.6 Smart Growth Matrix Application

Metro, unlike Dallas, has a high tolerance for the full array of planning, regulatory, market, and investment administrative approaches to pursue transportation and growth management goals. In applying the smart growth matrix to the Portland Metro context, it is clear that Portland pursues all the goals by virtue of the nineteen state planning goals and Metro's own Region 2040 vision plan. In applying the suitability and characterization matrices, there are few limitations in terms of overall choices, since the region is large, faces rapid growth pressures, is combating congestion, and has a pro-planning culture. The one exception to the suitability variables is implementation level. As a regional planning and service provider, Metro is something of a cross among state, regional, and county powers and activities. However, it lacks land-use regulatory authority (such as zoning and subdivision controls) except as it exercised through rulemaking to implement the state growth-management act and the 2040 plan. Metro is known to be an innovator (willing to undertake experimental programs) and has not shied away from higher-cost strategies and policy actions when they offered strong implementation gains. Thus, looking across the fifty transportation policy actions, there are thirteen possible policy tools the region could consider that it presently does not use to pursue its smart growth goals. These include:

1. Road Pricing: Toll Roads
2. Congestion Pricing: HOT lanes
3. Congestion Pricing: Areawide or Cordon Pricing
4. Congestion Pricing: AVI
5. Distance-based Taxes
6. Transit Fare Adjustment
7. Location Efficient Mortgages
8. Live Near Your Work Program
9. Job Access and Reverse Commute
10. Fix It First Strategies for Roadway Investments
11. Land-Use Expert Panels
12. Transportation Management Associations
13. Jobs Access and Reverse Commute

Using the effectiveness matrix, none of the policy tools are completely eliminated from consideration (keeping all the very and somewhat effective rated tools under consideration), although transportation management associations and location efficient mortgages were borderline in terms of overall effectiveness. In many cases, such as road pricing, congestion tools, and objective-based strategies, Metro would need to coordinate with several other service providers to bring about policy change. However, this is a role that Metro has been comfortable playing in the past through its technical support, research, education outreach, and service cost sharing.

Applying the growth-management component of the smart growth matrix reveals several untapped policy choices as well. Following the same decision criteria, Metro could consider sixteen of the fifty-nine possible growth-management tools to help them further their goals:

1. Rehabilitation Zoning
2. Inclusionary Zoning
3. Split Rate Property Tax
4. Developments of Regional Impact
5. Farmland Preservation Credits
6. Differential Assessment

7. Agricultural and Forest Programs
8. Sensitive Area Zoning
9. Development Exactions
10. Impact Fees
11. Cost-based Utility and Stormwater Fees
12. Growth Phasing for Public Facilities
13. Rate of Growth Allocation Systems
14. Carrying Capacity Limitations
15. State Development Plans
16. Strategic Policy Plans

Applying the effectiveness matrices across all applicable cells, does not eliminate any of the above sixteen tools from consideration, although rehabilitation zoning codes and agricultural and forestry programs were nearly eliminated owing to lower effectiveness ratings. As in the case of transportation policy choices though, many of these tools and techniques cannot be implemented by a regional government alone. Although certainly carrying capacity limitations, strategic policy plans, cost-based utilities, and developments of regional impact all fall within the enabling authority of Metro. Metro and its supporters of smart growth have been successful over the years in obtaining legislative authority to try new transportation and growth management approaches that many parts of the country have yet to even consider trying. And as mentioned in the transportation strategies section, Metro is considering use of pricing strategies (e.g., HOT lanes) and objective-based strategies (e.g., location efficient mortgages) to reduce congestion and enhance multimodal transportation. The *key point* is that the smart growth audit and diagnostic process provides a foundation for a new dialogue on how things could be done better, even for what is often referred to as the poster city for smart growth. The dialogue that ensues offers to expand the realm of possibilities in transportation and growth-management discussions, where new hybrid ideas might well take root or be invented.

5.4 CASE THREE: MARYLAND DOT

5.4.1 Background

Maryland is a small, highly urbanized state that has about 12,406 square miles of land and surface water (about the size of the Houston metropolitan region). There are 190 local governments or jurisdictions in the state divided among 23 counties, 10 inter-county agencies, and 157 towns and cities. In 2000, there were an estimated 5.3 million Marylanders. National Population Growth's projections for Maryland suggest a population close to 7.2 million by 2050, which is almost 2 million more than at present (Bouvier 2003). Nearly 90% of the state's population resides within the Washington-Baltimore consolidated metropolitan statistical area (Maryland State Archive 2003).

In 1985, Maryland's Department of State Planning published a report titled "Land Use or Abuse?" that raised concerns about patterns of sprawl within the state (Maryland Department of State Planning 1985). The report noted two disturbing trends. First, residential uses accounted for 90% of the increase in urban and suburban land in Maryland during the 1970s. The overwhelming majority of this residential development was very low density. Second, the acreage covered by new residential development increased nearly three times as fast as its population. That meant that the amount of land being used per capita was increasing in a manner that was highly inefficient compared to the state's historical patterns. The report also noted that increasing urban disinvestment was creating large capital costs that might not be necessary for the public to carry. School construction costs made the point poignantly clear. Between 1970 and 1990, one Maryland County closed over sixty existing schools while simultaneously building sixty new schools farther out from the urbanized area, an endeavor which cost around $500 million. The handful of new students who suddenly push an existing school past capacity generates an enormous marginal cost per student to the district that must build a new school (Kelly 1993, p.174).

New infrastructure development in suburban areas such as the sewer plants, water treatment plants, or new road constructions were expected to have an even greater adverse cost impact on Maryland. (Maryland Study Commission 1991) In 1991, the Governor's Commission on Growth in the Chesapeake Bay Region compared two alternative statewide growth scenarios. The commission projected capital infrastructure costs for roads and utilities totaling $9,191 per

single-family unit under the "trend" growth scenario of continuing sprawl, but under a more compact scenario, projected $4,104 per unit (Governor's Commission on Growth in the Chesapeake Bay Region 1991). Statewide, the study revealed that sprawl development caused a 15% increase the capital costs as compared with smart growth development. More recent research shows that over the next 20 years, sprawl will cost Maryland residents about $10 billion more for new roads, schools, sewers, and water than if growth were more concentrated (McMahon 1997).

While infrastructure costs and land-use efficiency are important issues in Maryland, most of the most recent efforts for growth management or smart growth in Maryland can be traced to the state's concern with mitigating the impact from suburban encroachment into Maryland's environmentally sensitive areas (Cohen 2002). In particular, the health of the Chesapeake Bay was a key factor in stimulating the state's earliest anti-sprawl efforts.

Chesapeake Bay is North America's largest and most productive estuary. The bay is 195 miles long and 30 miles wide, bordered on either side by tidewater Maryland and Virginia, and an incredibly complex ecosystem that includes important habitats and food webs. (Horton and Eichbaum 1991) The bay itself, its rivers, wetlands, trees, and land all provide homes, protection, or food for complex groups of species. A series of alarming reports in the early 1980s led to several federal and state initiatives to restore the Bay. In 1985, the Maryland State Planning Commission set of a number of goals aimed at reducing nutrients, reducing toxins, protecting living resources, and establishing cooperation among many federal state and local institutions. A key finding of subsequent State Planning Commission reports was that low-density sprawl in proximity to the bay and the rivers that flow into the bay were responsible for much of the environmental degradation they were battling. Lack of growth management controls were at the heart of the problem (Chesapeake Bay Program 2002).

As a result, the Maryland legislature adopted the *Maryland Economic Growth, Resource Protection, and Planning Act of 1992* to encourage economic growth and regulatory streamlining. Under the act, once a local comprehensive plan is adopted, local government may approve development projects that include state funds *only* if they are consistent with the plan. The state also *may not fund a transportation project* unless the project is consistent with the local plan. The Maryland Department of Planning (MDP) must provide written commentary on the environmentally sensitive area elements of all comprehensive plans, but local governments need

not incorporate the state's recommendations. In a 1996 annual report, Maryland's Growth Commission reviewed the 1992 Planning Act and asserted that it did not adequately steer growth away from environmentally sensitive zones or help to revitalize older cities.

In 1997, the Maryland General Assembly responded to this critique through the *Smart Growth Initiatives Act,* which sought to better curb sprawl development patterns in Maryland's rural areas and to revitalize existing developed areas (Maryland State Office of Planning 2003). Following many meetings, forums, and a gubernatorial campaign, Maryland developed five smart growth initiatives: Priority Funding Areas (PFAs); Rural Legacy (Natural Resource Protection); Voluntary Cleanup (Brownfields); Live Near Your Work (LNYW); and Job Creation Tax Credits (JCTC). Though Maryland's 1997 smart growth policies are relatively new and many effects of the policies are still unknown, the smart growth policies have attracted national attention because of the numerous incentives that encourage voluntary implementation of smart growth practices (Preservation Alliance of Virginia 2003). The 1997 Smart Growth Act strengthened the role of the state through a cabinet-level coordinating group, and brought state level transportation and land-use planning and policy into tighter coordination than had ever been accomplished before. In short, the law and gubernatorial leadership established a state-level partnership for quality growth and development. The following two sections look at what transportation and growth-management strategies and policy actions are currently in place or that are encouraged by the Maryland DOT (MDOT), and in the following section the smart growth matrix is used to identify other strategies and policy actions that the MDOT might encourage or support with its partner state agencies or in conjunction with regional service providers and localities.

5.4.2 What's in Place? Transportation-related Strategies and Policy Actions

Among the 1997 smart growth initiatives, two relate specifically to transportation: Priority Funding Areas (PFAs) and Live Near Your Work (LNYW). While the PFA's policy refers to one of growth-management strategies, it also relates to transportation strategy because state monies for transportation are invested only in PFAs. The LNYW program is one of objective-based strategies using incentives. The goals of the LNYW program are to reduce auto VMT, to strengthen community livability, and to minimize environmental impact. In addition to the above two smart growth initiatives, MDOT has undertaken to help forward the state's smart

growth policy agenda through transportation-related strategies. The paragraphs below describe some of the discrete efforts. These efforts include following transportation-related strategies: transportation-efficient land-use planning and development strategies; alternative-mode support strategies; worksite-based strategies; and coordinating and integrating processes, plans, and functional assignments.

5.4.2.1Transportation-Efficient Land-Use Planning and Development Strategies

5.4.2.1.a Transit-Oriented Development

MDOT has taken an active role in promoting transit-oriented development around the state. The Maryland Transit Administration includes an Office of Transit-Oriented Development. The office administers several important programs including Neighborhood Conservation, Enhancements, Access 2000, Transit Station Area Development Incentives, and other funds to support streetscape improvements in TOD areas. MDOT has its own TOD incentive fund such as the Transit Station Smart Growth program. The goals are to provide transportation choices, to reduce auto VMT, and to promote land-use accessibility.

5.4.2.1.b Neighborhood Conservation

The MDOT neighborhood conservation program provides transportation improvements to stabilize and improve neighborhood areas, and to help implement local revitalization plans. Transportation improvements include streetscaping, drainage, curb and gutters, pedestrian safety improvements, lighting, bus shelters, and transit access. The goals are to ensure adequate level-of-service on roadways and to strengthen community livability.

5.4.2.1.c Corridor Preservation and Access Management

The Maryland State Highway Administration has used corridor preservation for a few of its major projects in rapidly developing areas. This corridor preservation program protects right-of-way along significant existing and proposed transportation corridors. It keeps transportation options open while permitting land-use changes to occur in accordance with local plans. Corridor preservation promotes efficient land use patterns and lessens the amount taxpayers must expend on future rights-of-way. The access management program supports corridor preservation

efforts by providing safe and efficient access to roadways to accommodate adjacent users. It also strives to ensure that safe traffic operations and flow exist along all highways. It executes this function, in part, through review of subdivision plans, building permits, site plans, and access permits.

5.4.2.2 Objective-Based Strategies: Incentives

5.4.2.2.a The Live-Near-Your-Work Program

This program encourages employees to purchase homes near their workplace. State grants are given to businesses and local governments that assist employees with their house purchase. The program provides a minimum of $3,000 to those who purchase homes in the designated areas. The goals of the program are to reduce employee commute time, reduce VMTs, and to stabilize targeted neighborhoods by promoting homeownership.

5.4.2.3 Alternative-Mode Support Strategies: Facility and Systems Improvements

5.4.2.3.a Transportation Enhancement Program

This program includes bicycle and pedestrian facilities, safety and educational activities for pedestrians and cyclists, acquisition of scenic easements and historic sites, scenic or historic highway programs, landscaping and other scenic beautification, historic preservation, historic railroad facilities and canals, preservation of abandoned railway corridors, control and removal of outdoor advertising, archaeological planning and research, environmental mitigation to address water pollution owing to highway runoff, and establishment of transportation museums. This program provides transportation choices and minimizes environmental impact on natural areas.

5.4.2.4 Worksite-Based Strategies

5.4.2.4.a Commute-Smart Program

The program is part of the state emissions reduction strategy to meet federal air quality attainment standards for air quality control regions. It includes telework, regional commuter

assistance, regional partnerships, clean vehicle technologies, congestion mitigation projects, and advanced transportation technologies. The primary objective is the reduction of traffic congestion and mobile source emission.

5.4.2.5 Coordinating and Integrating Processes, Plans, and Functional Assignments

5.4.2.5.a Plan Review

MDOT reviews and comments on all draft land-use plan updates that are submitted by local governments to the state's Department of Planning. These comments are shared with local governments prior to plan finalization. Although this effort may be preliminary, it can have a significant impact on the local plans and strengthen coordination among state and local governments.

5.4.2.5.b Land-Use Expert Panels

Maryland State Highway Administration uses land-use expert panels when there are important issues about the links between the characteristics of a planned road projects and local environmental and land-use priorities. The panels help consider whether land uses are likely to change as a result of planned transportation improvements.

5.4.3 Growth-Management-Related Strategies and Policy Actions

Maryland's Smart Growth Initiatives were indeed built on the planning framework established by the 1992 Planning Act, but they were also based on a long history of urban growth management experiments. The Planning Act of 1992 required local governments to prepare comprehensive plans but did not provide the state with the expansive responsibilities for growth management. The 1997 program showed a more active role for state planning to prevent sprawl and made more resources available to direct to cities and inner suburbs. Maryland is using mostly the strategies of urban containment and natural resource preservation in growth-management-related strategies. In particular, urban containment strategies are used by various approaches like targeted growth, compact development, and property taxation.

5.4.3.1 Urban Containment Strategies:

5.4.3.1.a The 1997 Smart Growth Area Act and Priority Funding Areas (PFAs)

PFAs are the centerpiece of Maryland's Smart Growth Initiative. It constraints the state from subsidizing low-density development and directs state funding into already developed areas and areas planned for future growth. The areas designated as "smart growth areas" or "priority funding areas" may qualify for state funds for transportation, housing, economic development and environmental projects. These are locations that the state and local governments have decided would be most appropriate for future economic development and growth, with minimal sprawl effects. Areas must meet several guidelines in order to qualify as a priority funding area. These guidelines include intended use, availability of sewer and water systems, and permitted residential density. According to Knaap (2001), PFAs combine the objectives of urban growth boundaries (UGBs) with an infrastructure subsidy program that is spatially defined.

5.4.3.1.b The Brownfield Voluntary Cleanup and Revitalization Incentive Programs

This program provides financial and technical assistance to eligible participants in the cleanup and redevelopment of underutilized or abandoned industrial properties that are contaminated. The program provides a 50% tax break on the increased assessment resulting from property improvements. The 1997 smart growth legislation established a Brownfield Revitalization Incentive Program (BRIP) within the Maryland Department of Business and Economic Development, which provides grants and low-interest loans. The state's new policy of targeting public school construction funds for the renovation of existing schools can result in the physical upgrading of previously neglected, inner-city schools.

5.4.3.1.c Property Taxation: Maryland's Job Creation Tax Credit (JCTC) Program

This program encourages small business development and job growth in areas with an available labor force and also makes more efficient use of existing infrastructure. It originally was established in 1996 but amended in the 1997 Smart Growth Initiatives. The 1997 JCTC program required a participating business to declare its intent to use the credit prior to hiring, and to create twenty-five new jobs in smart growth and priority funding areas; increased incentives in state enterprise zones, federal empowerment zones, and state-designated revitalization areas; and

increased the basic credit of $1,000 per employee to $1,500 in the designated areas (Annotated Code of Maryland, Article 83A, 5-1101-1103).

5.4.3.2 Natural Resource Preservation: Land Preservation

5.4.3.2.a The 1997 Rural Legacy Act

This program provides funds to local governments and to land trusts to purchase land, conservation easements and development rights in *rural legacy areas* to preserve agriculture, forest, and natural resource lands in contiguous blocks, corridors, or greenways. Multiple goals for the program include preserving wildlife habitat, reducing pollution into streams and the Chesapeake Bay, supporting the state's resource-based industries from sprawl development, reducing public infrastructure costs of sprawl, and preserving a *sense of place* in the countryside. Through this program the state expects to protect approximately 240,000 acres of resource lands by the year 2011. Like PFAs, the rural legacy program also is influenced by a long history of land-use planning and management, and shares structural similarities with purchase and transfer of development rights programs (Knaap 2001).

5.4.4 Smart Growth Matrix Application

Maryland's Governor set the tone for what was an acceptable approach to smart growth for the state. Although planning approaches are accepted and expected, the vast majority of the state's efforts focused on market and capital investment-based approaches to limit sprawl and promote other important social, economic, and environmental objectives. In applying the smart growth matrix to MDOT's context, and reviewing the state planning documentation, the only goal not covered by the smart growth matrix was *Promoting Social Equity.* In applying the suitability and characterization matrices, there are few limitations in terms of overall choices because the state agency has capacity in staffing, faces high growth pressures, is combating congestion, and has a pro-planning culture. The one exception to the characterization matrix is implementing authority that could be said to encompass both state and MPO levels given the strong coordination that occurs across those levels in Maryland. Thus, looking across the fifty transportation policy actions, and removing nine tools from consideration based on *implementing authority*, there are thirty-three possible policy tools the state DOT could consider that it

presently does not use or facilitate for smart growth goals. Applying the effectiveness matrix to consider just the more effective choices reduces the possible tools down to seventeen options:

1. Parking Demand Management
2. Toll Roads
3. Gasoline Tax Increase
4. Congestion Pricing: HOT
5. Congestion Pricing: Areawide or Cordon
6. Congestion Pricing: AVI
7. Alternative Roadway Design
8. Bus Transit Service Improvement
9. Custom Transit Services
10. Non-motorized Facility Support
11. LRT Investment
12. BRT Investment
13. Commuter Rail
14. Alternative Work Schedules
15. Location Efficient Mortgages
16. Job Access and Reverse Commute
17. TGM Joint Program/Consortium

Although tools such as parking demand management, bus transit, and LRT and BRT investments may be implemented by other agencies, a DOT could still be supportive of such policies to further important state smart growth goals. In many cases, such as road pricing, congestion tools and alternative roadway design, the DOT has considerable control and influence to further such activities in the state. Other tools such as non-motorized facility support, TGM, and location efficient mortgages would require realignment of enhancement funds and the creation of new partnerships and collaborations.

Applying the growth management component of the smart growth matrix reveals several untapped policy choices as well. Following the same decision criteria, MDOT could consider fifteen of the fifty-nine possible growth management tools to help further its goals:

1. Land-Use Information Systems
2. Split-Rate Property Tax
3. Extra-Territorial Jurisdiction
4. Annexation
5. Inter-jurisdictional Agreements
6. Tax-Base Sharing
7. Water Quality Protection Programs
8. Water Quantity Protection Programs
9. Streamlined Permitting Systems
10. State Policy Assessments
11. Capital Improvement Programming
12. Adequate Public Facility Requirements
13. Regional Growth Management Hearing Board
14. Regional Planning Councils
15. Regional Service Providers

As in the case of transportation policy choices, many of these tools and techniques cannot be implemented by a state government agency alone. Although water quality and quantity protection programs, land supply information systems, and inter-jurisdictional agreements fall well within the bounds of a DOT's authority, several other policy choices would require state legislative action or the creation of new partnerships and collaborations across local, regional, and state levels.

5.4.5 Conclusions

As with most states with strong growth-management programs, Maryland's success in passing smart growth legislation was made possible by strong leadership from Maryland governor, Parris Glendening. In 1996, he realized that prevailing planning regulatory practices were insufficient to prevent suburban sprawl and the decline of aging cities and inner suburbs. According to MDP's Planner Ron Young, Governor Glendening was interested in a strategy that was incentive-based, would not intrude on local land use authority, could be implemented immediately, would not require creation of a new bureaucracy, and would rely mainly on

reprioritization of existing spending rather than new spending. Local governments, property owners, residents, farms, and business can do anything they want, but state funds are not available unless they follow state smart growth criteria such as within PFAs, cleaning up contaminated sites, or purchasing homes near work. This reliance on incentives may be what enabled these programs to pass the Maryland legislature and what has made them so attractive to other states. (Knaap 2002, p.8). From a comparative standpoint, Maryland's DOT is relatively small compared with DOTs in states with large geographic areas and does not have the extensive rural areas and small towns such as found in Texas.

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5.5 CHAPTER CONCLUSIONS

It is important to reiterate that analysis with the smart growth matrix does not provide a clear or definitive answer for the community using it, but serves as a starting point and as a way to focus discussion in a policy debate on better ways to accomplish smart growth goals. It moves the interested group through a discussion about strategies and tools that are already in use—and whether they are working or not—to ideas about what might help further their goals and interests, to criteria to narrow the range of alternatives. They will look at a manageable list of options that they might not otherwise consider. From this starting point, the agencies have considerable work still to do to further evaluate the alternatives and to develop an effective set of policy actions that will help the community and other agencies to attain their goals. The included literature review and glossary help them move down that investigative path and dialogue.

CHAPTER 6. CONCLUSIONS AND FUTURE RESEARCH

6.1 CONCLUSIONS

The sprawl mitigation matrices presented in this report catalogue transportation-related and growth-management policy actions with respect to goals, characteristics, suitability, and effectiveness factors. These matrices are designed as a guide for communities in Texas and elsewhere in the selection of sprawl mitigation techniques appropriate to their specific contexts. The three case applications reported in this report clearly demonstrate how the various matrices can be used to winnow down the 109 policy choices to a manageable subset that matches a community's abilities and interests relative to commonly identified smart growth goals. The matrices provide an important starting point for communities to diagnose their existing efforts and expand their search for additional appropriate strategies and policy actions.

6.2 FUTURE RESEARCH NEEDS

The literature review completed for the effectiveness matrices clearly reveal the paucity of data for most of the 109 strategies and policy tools. Over thirty policy actions had no substantive evaluative research to speak of. In other cases, the quality of what has been completed is at time of questionable quality or largely anecdotal in nature. For example, Taylor and Fink (2003) state that the research literature explaining transit ridership is surprisingly uneven, is in some cases poorly conceived, and the results are often ambiguous or contradictory. In the realm of growth management, Blanco (undated) makes a similar observation on the growth-management implementation literature noting that there is a lack of "systematic studies with agreed upon measures concerning effective techniques that state growth management programs use." There is an inadequate amount of solid empirical evidence on urban growth-management tools and systems to inform practice. Thus, it is clear much more evaluation work needs to be completed to build a broader base of understanding on effective transportation and growth management policy actions. One of the more important opportunities that may arise from this report, should it be used extensively by departments of transportation, metropolitan

transportation organizations, and localities, is the ability to compare the performance of "transportation and growth management systems." As was demonstrated in the applications chapter, a first step in the use of the matrix is identifying all the tools that are already in place. If one had several hundred of these matrices completed, you could then begin to look at varying "packages" of strategies and techniques to identify the tools and techniques that are most effective in varying contexts. As several of our panelists noted, the most interesting question is "what package of tools" has the greatest desired effect in varied situations. Finally, a proposal was suggested from a member of the expert panel to create a software package based on this work to provide communities with easy access to guidance on appropriate strategies.

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Washington: WDOT and Growth Management Act
Washington: WDOT's Growth Management Act, Position Paper, Nov. 1997
Wisconsin Department of Transportation

[1] The references were received (as attached documents) in personal contacts with state DOTs.

APPENDIX A

Table A-1 Legal Authority for Transportation-Related Policy Actions

Strategy		Policy Action	Legal Authority				
			State	Regional	Home Rule City	General Law City	Counties
Transportation-Efficient Land Use Planning and Development Strategies		Rail-Based Transit-Oriented Development (TOD)[1]		v	v		
		Bus-Based Transit-Oriented Development (TOD)[2]		v	v		
		Traditional Neighborhood Development (TND)[3]			v		
		Main Street Program (Downtown Revitalization)[4]			v		
		Corridor Preservation and Planning[5]			v		
		Access Management Program					
		Neighborhood Conservation Program[6]			v		
		Jobs-Housing Balance Programs					
		Parking Supply Management : Flexible Requirements[7]			v		
		Parking Restriction : Area wide Parking Caps					
Pricing Strategies	Automobiles / Roadways	Parking Demanding Management					
		Gasoline Tax Increase[8]	v				
		Road Pricing: Toll Roads[9]	v	v	v		
		Congestion Pricing: High Occupancy Toll (HOT) Lanes[10]			v		
		Congestion Pricing: Area-Wide or Cordon Pricing					
		Congestion Pricing by Automatic Vehicle Identification (AVI)					
		Distance-based Taxes[11]	v				
	Transit	Transit Fare Adjustment[12]		v			
Alternative Mode Support Strategies	Facility and Systems Improvements	Traffic Calming[13]	v		v		
		Alternative Roadway Design Standards[14]	v		v		
		High Occupancy Vehicle (HOV) Facilities[15]			v		
		Bus Transit Service Improvement[16]		v			
		Custom Bus Transit Services					
		Non-Motorized Mode Facility Support[17]	v	v	v		
		Park & Ride Lots[18]		v			
		Transportation Enhancements Program[19]	v	v	v	v	v
		Car sharing and Ridematching Services[20]		v	v		
		Vanpooling and Ridematching Services		v	v		
		Information Technology Applications for Transit and Ridesharing Modes[21]	v	v			
	Capital Investments	Light Rail Transit Investments[22]	v	v	v		
		Bus Rapid Transit Investments[23]	v	v	v		
		Commuter/Heavy Rail Transit Investments[24]		v	v		
	Public Education	Public Education and Promotion for Alternative Modes[25]	v	v			
Worksite-Based Strategies		Monetary Incentives of Employers for Alternative Mode Use					
		Alternative Work Schedules[26]		v			
		Worksite-Parking Management					
		Employment-Based Proximate Commuting Program					
		On-Site Facility Amenities Provision					
		Transportation Management Associations[27]		v			
Objective-Based Strategies	Incentives	Location Efficient Mortgages (LEM)[28]					
		Live Near Your Work Program					
	Service Provisions	Job Access and Reverse Commute Program[29]		v	v		
Roadway Investment Strategies		Fix-It-First Strategies for Roadways Investment					
Coordinating and Integrating Processes, Plans, and Functional Assignments		Performance Measurement Tied to Growth Management Goals					
		Coordinating Plan Review Process					
		Trip Reduction Ordinances and Programs[30]	v	v	v		
		Funding Allocation System Tied to Growth Management Goals					
		Land Use Expert Panels					
		Transportation and Growth Management (TGM) Joint Program/Consortium					

References for Table A-1

[1] The City of Dallas (1996) and Houston Metro

[2] The City of Austin: The plan for the Triangle and Austin Capital Metro

[3] The City of Austin has a Traditional Neighborhood District zoning ordinance.

[4] The City of Austin: Downtown Redevelopment Program

[5] "The City of Austin, with the assistance of professional consultants and a citizens advisory group, is beginning the process of identifying what, how, and where corridor planning will take place."
The City of Austin website: http://www.ci.austin.tx.us

[6] The City of Austin: Neighborhood Planning

[7] The City of Dallas: Reduced minimum requirements in parking code

[8] HB 3106

[9] The City of Houston, Section 1216(a) of the Transportation Equity Act for the 21st Century (TEA-21)

[10] The City of Houston

[11] The 2001 session (H.B. 45) of the Texas Legislature.

[12] The example: Metropolitan Transit Authority of Harris County (Metro)

[13] HB 2204 the Matthew Brown Act: implementing traffic calming programs in neighborhoods around schools. The City of Austin has a Neighborhood Traffic Calming Program and
City of Houston, Texas, USA - Department of Public Works and Engineering, Policies and Procedures for Speed Hump Installation

[14] TxDOT: Roadway Design Manual and The City of Round Rock

[15] The City of Dallas, Houston, and Austin

[16] The example: Metropolitan Transit Authority of Harris County (Metro)

[17] HB 2204 the Matthew Brown Act: building on-road bicycle facilities and Regional Bicycle and Pedestrian Plan by Houston-Galveston area Council

[18] The example: Metropolitan Transit Authority of Harris County (Metro) , Austin Texas Capital Metro Transit

[19] In Houston Bikeway Program, federal funds are from Statewide Transportation Enhancement Program and local funds are from City of Houston and Metro. A project in Taylor County
was approved by the Texas Transportation Commission for funding through the Statewide Transportation Enhancement Program

[20] Sources: American Public Transit Association, Texas Natural Resource Conservation Commission

[21] Houston Smart Commuter ITS Operational Test (TxDOT, Houston Metro, FTA, FHWA, and TTI)

[22] TxDOT :a major investment study (MIS), Houston Metro, the City of Dallas, and Fort Worth's Tandy Subway

[23] TxDOT, the City of Austin and Austin Capital Metro

[24] Trinity Railway Express: Commuter rail provider located in Dallas-Fort Worth, Texas. City of Dallas: commuter rail

[25] Texas Natural Resources Conservation Commission and Alamo Area Council of Governments

[26] The Houston-Galveston Area Council hosted a conference to introduce Commuter Choice to hundreds of local employers.

[27] The North Central Texas Council of Governments (NCTCOG): the Central Dallas Association is a TMA that serves the Dallas Central Business District. That was approved by the
Travel demand management (TDM) committee in the NCTCOG.

[28] LEMs are being piloted in San Francisco, Chicago, and Seattle.

[29] The City of Abilene, The City of Brownsville, North Central Texas Council of Governments, Gulf Coast Center and Island Transit (Galveston), City Transit Management Company (Lubbok),
and Alamo Area Council of Governments (San Antonio)

[30] H.B. 992: the Texas Natural Resource Conservation Commission and the North Central Texas Council of Governments (NCTCOG)

Table A-2 Legal Authority for Growth Management-Related Policy Actions

Strategy		Policy Action	Legal Authority				
			State	Regional	Home Rule City	General Law City	Counties
Urban Containment Strategies	Targeted Growth	Urban Growth Boundaries (UGBs)					
		Intermediate Growth Boundaries					
		Urban Development Reserves					
		Urban Service Areas/Boundaries (USAs or USBs)					
		State Capital Investment Priorities (Priority Funding Areas)					
		Development Policy Areas					
	Compact Development	Infill Development[i]			v		
		Cluster Development			v		
		Brownfield Redevelopment[ii]			v		
	Zoning Approaches	Mixed-Use Land Development[iii]			v		
		Minimum Density Zoning/Standards			v		
		Planned Unit Development (PUD)[iv]			v		
		Overlay Zoning/Districts			v		
		Upzoning/Downzoning			v		
		Floating Zones			v		
	Property Taxation	Targeted Tax Abatement[v]			v	v	v
		Split-Rate Property Tax					
	Extrajurisdictional Controls and Agreements	Extraterritorial Jurisdiction[vi]			v	v	v
		Annexation[vii]			v		
		Interjurisdictional Agreements[viii]			v	v	v
		Tax-Base Sharing					
		Developments of Regional Impact					
Natural Resource Preservation	Land Preservation	Land Acquisition					
		Transferable Development Rights					
		Purchase of Development Rights					
		Conservation Easements[ix]		v			
		Farmland Preservation Credits					
		Differential Assessment Programs[x]		v			
		Agricultural and Forest Programs					
	Water Protection	Water Quality Protection Programs[xi]		v	v		
Facility Adequacy, Timing, and Planning	Facility Planning	Capital Improvement Programs (CIPs)[xii]			v	v	
	Facility Adequacy	Adequate Public Facility (APF) Standards/Requirements					
	Facility Financing	Development Exactions					
		Impact Fees[xiii]		v	v	v	v
		Special Financing Districts[xiv]			v	v	v
	Growth Limits/Controls	Growth-Phasing Systems for Public Facilities					
		Development Caps and Rate Allocation Systems					
		Carrying Capacity Limitations					
		Moratoriums[xv]			v	v	
Coordinating and Integrating Processes, Plans, and Functional Assignments	Plans	State Development Plans					
		Comprehensive Plans[xvi]			v	v	
		Specific-Area Development Plans[xvii]			v		
		Strategic Policy Plans					
	Processes	Streamlined Permit Processing					
		Vertical Plan Consistency Requirements					
		Horizontal Plan Consistency Requirements					
		Cross-Acceptance Process					
		Comprehensive Plan Consistency Requirements					
		State Policy Assessment					
	Functional Assignments	Regional Growth Management Hearing Board					
		Regional Planning Councils[xviii]			v	v	v
		Regional Service Provider					

References for Table A-2

[i] The example: A partnership project between Anderson Community Development Corporation, U.S. HUD, and the City of Austin.
[ii] The example: The City of Dallas
[iii] Chapter 25-3 of the City of Austin's City Code allows for Traditional Neighborhood development by right. The purpose of Austin's traditional neighborhood district is to encourage mixed-use and compact development.
[iv] Texas Municipal Zoning Law 17.03 and Dallas Development Code 51-4.102 (1)
[v] Tax Abatement Act
[vi] House Bill (H.B.) 1445
[vii] Municipal Annexation Act (1963), S.B.89 (1999), Texas Local Government Code, Chapter 43
[viii] House Bill (H.B.) 1445
[ix] State programs, Tex. Nat. Res. Code Ann. §§ 183.001 to .005 (Uniform Conservation Easement Act) and Tex. Tax Code Ann. § 6.12
[x] State programs, Tex. Nat. Res. Code Ann. §§ 183.001 to .005 (Uniform Conservation Easement Act) and Tex. Tax Code Ann. § 6.12
[xi] The example: The City of Austin-WATER QUALITY PROGRAMS, Regional agencies: Brazos River Authority
[xii] S.B.336 (1987) Chapter 395
[xiii] Section 395.001 (7) of the Texas Local Government Code: (1)municipalities (2) districts (Article III, Section 52) (3) certain counties (Section 395.079 of the Texas Local Government Code)
[xiv] Tax Increment Financing Act, The example: The City of Houston(Tax Increment Reinvestment Zones)
[xv] S.B.980 (2001)
[xvi] Texas Local Government Code, Chapter 213
[xvii] The City of Corpus Christi has adopted the Dune Protection and Beach Access Plan in 1993 and Southside Area Development Plan in 2000.
[xviii] Texas Local Government Code, Chapter 391: "Any combination of counties or municipalities or of counties and municipalities may agree, by ordinance, resolution, rule, order, or other means, to establish a commission."

APPENDIX B

Appendix B-1

Description of Transportation-Related Policy Actions for Mitigating Urban Sprawl

Access Management Program

Access management is the coordination of land use and access to the highway. Access management along existing highways occurs over a period of time through the county development process, by directing newly developing or redeveloping parcels to new access points, future service roads or public roads. A major tool of access management is to control local access to highway capacity through plans, regulations, and negotiated agreements between appropriate levels of government in ways that ensure that regional needs, adequate system capacity, and public health and safety are protected and sprawl is minimized. Case/Example: Access Management Programs of Maine, Maryland, and Oregon DOTs. Source/Reference: Maryland DOT, B.

Alternative Roadway Design

Alternative roadway design strategies fall into two general categories: 1. Local street design, including "connectivity" and "skinny street" ordinances, and 2. Context-sensitive design for freeways and other large-scale projects. Portland, OR, for example, has adopted an ordinance that reduces the maximum allowable block length in new developments to 300(?) feet and the required width for residential streets to 28 feet and sidewalk width of at least 5 feet and landscaped pedestrian buffer strips that include street trees.

The Federal Highway Administration has promoted the concept of flexibility in highway design, enabling state departments of transportation to design new and rebuilt facilities that are sensitive to the local context. Context-sensitive design includes provisions for local traffic, including non-motorized modes, and attention to the aesthetic qualities of facilities. Source/Reference: Portland Metro, 2001.

Alternative Work Schedules

Employers can institute a wide variety of alternative work schedules in order to reduce or redistribute commute trips and/or to make it easier for employees to take advantage of HOV commuting opportunities. Alternative work schedules take three forms as follows. 1) Compressed work schedules allow an employee to stay home from work on one day each week or one day every two weeks. 2) Flexible work hours or "flex-time" is a strategy whereby an employer allows employees to set their own starting and ending hours. 3) Multiple work shifts can be used for manufacturing operations. Effectiveness of the different scheduling strategies varies. There is a question as to whether compressed workweeks reduce trips/VMT, or just give people an extra day to make non-work trips, thereby offsetting any reductions from eliminating commute trips. Source/Reference: WSDOT, 2000, pp. 25-26.

Bus-Based Transit-Oriented Development (TOD)

Maryland DOT defines a TOD as a place of relatively higher density that includes a mixture of residential, employment, shopping, and civil uses and types located within an easy walk of a bus ("Bus-Based TOD") or a rail transit center ("Rail-Based TOD"). There are two primary types of bus service that impact the urban form of TODs: 1) express buses operating on dedicated rights-of-way, or along HOV lanes on major highways and freeways work in a similar fashion to commuter rail; 2) local shuttle or feeder bus services. Bus rapid transit systems may provide efficient transportation, but they do not perform well as catalysts for economic development since bus routes are not

permanent, real estate developers prefer fixed rail's permanence. Busy local bus routes often are candidates for the application of TOD principles because their routes follow mature corridors that already possess many of the desired characteristics. There are some successful examples of a bus-based TOD. Cities like Ottawa, Canada and Curitiba, Brazil show that bus-based TODs can be as successful as rail-based TODs as long as they are accompanied by foresighted, intelligent planning. Case/Example: Ottawa, Canada and Curitiba, Brazil. Source/Reference: Maryland DOT, 2000, pp. 4-7; Cervero, 2000, pp. 9-10; ARC, A.

Bus Rapid Transit Investments

See Bus-Based Transit-Oriented Development (TOD).

Bus Transit Service Improvement

The provision of good transit service is essential for the success of almost any TDM strategy. Transit services can be improved by making it faster and more reliable, adding new routes, adding express routes, extending operating hours and decreasing headways. Comfort and convenience can also make a difference: for example, air conditioning, upholstered seats that recline, systemwide transit passes, and fast/automatic payment methods. In addition, with the development of exclusive busways, HOV facilities, signal prioritization, and the changing of boarding procedures, bus transit can begin to approach the efficiency of rail transit, known as BRT (Bus Rapid Transit). The average response to frequency improvements for bus service is roughly a 0.68% ridership gain per 1% frequency increase. Decreasing wait times by 1% can result in a 0.3% ridership increase, and decreasing travel time by 1% can result in a 0.6% ridership increase (JHK & Associates, 1995). Source/Reference: WSDOT, 2000, pp. 7-8

Carsharing and Ridematching Services

Shared use cars are placed in neighborhoods (generally in reserved spaces in parking lots) and members may reserve them to use on an hourly basis. Carsharing organizations may be small co-operatives, nonprofits, or third parties - either publicly subsidized or private, moneymaking enterprises. Location-efficient mortgages (which allow people to live in mixed use, compact neighborhoods well served by transit) and carsharing work together especially well by providing synergistic economic incentives. Carsharing reinforces that locational preference by giving people an economic incentive to use transit and only use a car when they need it. In the U.S., several urban areas are experimenting with the carsharing concept, including the San Francisco Bay Area, Boston, Seattle, and Portland. In Washington, ridematching services are most frequently operated by transit/rideshare agencies, which maintain large databases of interested commuters in order to coordinate potential ridesharers. Some employers also operate their own ridematching services in-house. Technical advances have led to demonstrations of dynamic (real time, web-based) ridematching and the utilization of the ridematch concept for non-commute travel. Studies have estimated that ridematching services can achieve reductions in regional VMT from 0.1-3.6% (PSRC, 1994, pp. 26 and PSRC, 1993). Case/Example: San Francisco Bay Area (CA), Boston (MA), Seattle (WA), and Portland (OR). Source/Reference: WSDOT, 2000, pp. 5-6 and pp. 22.

Commuter/Heavy Rail Transit Investments

There are crucial differences in the choice of mass transit technology that affect the patterns of land uses and the arrangement of buildings and public spaces around transit stations and corridors. Characteristically,

commuter-rail transit stations need to be 2 to 5 miles apart to allow long acceleration and deceleration times required by diesel powered locomotives. Tracks are generally separated from other urban uses except at stations, where some limited integration with streets and pedestrians is permissible. Conventional commuter rail suffers from several of the same problems as heavy rail systems in terms of difficulties with pedestrian friendly environments along the transit corridor. At the stations, however, because there are no electrical rails or wires a greater degree of integration with vehicles and pedestrians can be achieved. The Metropolitan Atlanta Rapid Transit Authority (MARTA) in Georgia is an example of the type of heavy rail transit system. The heavy rail system is one of high capacity and high speed necessitated by the ridership demand to travel relatively long distances at greater speeds than is typical of the light rail and bus systems. By design the heavy rail system requires greater attention and emphasis on pedestrian environment in and around the transit station rather than along the transit corridors because of essential grade separation for operational and safety reasons. Source/Reference: ARC, A.

Congestion Pricing: Area-Wide or Cordon Pricing

Area-wide cordon pricing defines a restricted area and charges users to enter or exit specified zones such as a downtown central business district or suburban shopping area. Singapore's pricing scheme, in effect in the city's CBD since 1975, has reduced inbound peak period trips by 40%. However, afternoon peak congestion has not been reduced significantly, and traffic on bypass roads has increased (Comsis Corporation, 1993b. pp. 5-6). Case/Example: Singapore. Source/Reference: WSDOT, 2000, pp.73-74.

Congestion Pricing by Automatic Vehicle Identification (AVI)

AVI uses an electronic system (transponders and dectors) to identify vehicles and charges an appropriate road fee. The fees can be varied by the time of day, level of congestion, miles traveled, and choice of roadway to create a complex region-wide pricing program. Source/Reference: WSDOT, 2000, pp.73-74.

Congestion Pricing: High Occupancy Toll (HOT) Lanes

HOT lanes charge variable tolls for the use of HOV (High Occupancy Vehicle) lanes that depend on the level of congestion and number of people in the vehicle. HOVs and transit may travel on HOT lanes for free, while SOVs may use them for a price. Examples of HOT lanes can now be found in San Diego, the Katy Freeway in Houston, and SR 91 in Orange County, California. Case/Example: HOT lanes in San Diego and SR 91 in Orange County (CA) and the Key Freeway in Houston (TX). Source/Reference: WSDOT, 2000, pp. 73-74.

Coordinating Plan Review Process

Currently, Maryland DOT (MDOT) reviews and comments on all draft land use plan updates that are submitted by local governments to the state's Department of Planning (Maryland Department of Planning). These comments are shared with local governments prior to plan finalization. MDOT is exploring opportunities to provide inputs to local planning processes at a point farther upstream in the local planning process. MDOT's interest in this is grounded in the Department's belief that MDOT comments would have a greater impact at an earlier stage in the process. However, at present this effort is quite preliminary and tentative. Source/Reference: Maryland DOT, A.

Corridor Preservation and Planning

Corridor preservation is one means of coordinating transportation planning with land use planning and development to protect existing or planned transportation corridors from inconsistent development. Its goal is to prohibit, or at least minimize, development in areas that are likely to be required to meet transportation needs in the future. These areas include lands adjacent to existing roadways which are projected to require capacity expansion; areas which might be needed to construct entirely new routes for urban bypasses or to serve new neighborhoods or commercial developments; and land needed for bicycle, transit and pedestrian facilities. The process of protecting rights-of-way along significant existing and proposed transportation corridors allows for transportation options to remain open while permitting land use changes to occur in accordance with local plans. Corridor preservation promotes efficient land use patterns and lessens the amount of taxpayer dollars expended on future rights-of-ways and prevents costly relocations that disrupt residences and business. Source/Reference: Wisconsin DOT, 1994; Maryland DOT, A.

Custom Transit Services

Transit agencies are increasingly looking to custom transit services to serve transit markets, defined by geographic area or segment of the population or both, where traditional fixed-route transit services is infeasible or ineffective. Some of the various custom transit strategies include shuttles, circulators, feeder buses; Dial-a-Ride (paratransit) services; custom or subscription bus service; Personal Rapid Transit (PRT), Group Rapid Transit (GRT), worker/driver bus service etc. Source/Reference: WSDOT, 2000, pp. 11-12.

Distance Based Taxes

Distance-based taxes are designed to charge drivers in direct proportion to the distance they drive both to increase equity in the application of transportation fees and to discourage excessive consumption of transportation. VMT (Vehicle Miles Traveled) Tax is one such example in which the state or local government collects the tax based on odometer readings taken at the annual registration or inspection, or by using electronic tracking methods. The Puget Sound Regional Council estimates that a VMT tax could produce up to a 11% reduction in VMT and a 10% reduction in vehicle trips with a $0.05 per mile charge (PSRC, 1994. pp. 25). No examples of VMT taxes are currently found anywhere. Pay-as-you-drive vehicle insurance has been proposed as a way of tying insurance costs to distances driven and of converting an indirect cost of driving to a direct, out-of-pocket cost. Case/Example: cents-per-mile pricing for vehicle insurance in Texas; Bill 3871 introduced in the 2001 Oregon legislature provides tax credits to insurers that offer Pay-As-You-Drive pricing. Source/Reference: WSDOT, 2000, pp. 75,Victoria Transport Policy Institute

Employment-Based Proximate Commuting Program

Proximate commuting is an employment-based commute reduction strategy that offers multi-site employers (e.g., banks, retail, post offices, government agencies, manufacturers, etc) a program for minimizing inefficient long distance commuting. Employees of multi-site employers often live closer to several other work sites of the same employer than the site where they work. Through proximate commuting program employee commute patterns are assessed, commuters who could potentially work closer to their homes are identified, and voluntary transfers to

alternate shorter-commute sites are facilitated. Case/Example: Pilot Program in Key Bank (WA). Source/Reference: Office of Urban Mobility, 1995, pp. 49.

Fix-It-First Strategies for Roadways Investment

Traditional transportation planning and funding practices often favor capital expenditures over maintenance and operations. This encourages jurisdictions to expand transportation system capacity and implement major new projects even when they have inadequate resources to maintain and operate existing facilities, or when incremental improvements to existing facilities and demand management strategies would provide greater economic benefits. "Fix It First" means that transportation planning and funding give top priority to maintenance, operations and incremental improvements to existing transportation facilities, and major capital projects are only implemented if there is adequate additional funds. Source/Reference: VTPI, C; SELC & ELI, 1999, pp. 21.

Funding Allocation Systems tied to Growth Management Goals

Funding allocation systems can by tied to growth management goals, so that transportation projects that work towards these goals are given priority for funds. Full-cost analysis, which includes lifecycle costs and quantifies externalities, should be incorporated into such systems.. For example, Rhode Island DOT's Transportation Improvement Plan (TIP) development process has a funding allocation system that prioritizes projects that encourage compact development and penalizes those that encourage sprawl. As a result, the TIP allocates the vast majority of available funding to system management and system preservation projects, and funds very few system expansion projects. Case/Example: Rhode Island DOT's scoring system. Source/Reference: Governor's Growth Planning Council, 2001, pp. 7-8.

Gasoline Tax Increase

It is generally acknowledged that a significant fuel tax will be needed to de-subsidize auto use and make the costs of other alternative modes more competitive. Moderately increased fuel costs may be absorbed by the consumer without much change in travel. The Puget Sound Regional Council modeled a $2 per gallon increase in fuel taxes across the four county Puget Sound region and predicted a 7.2% decrease in VMT and an 8.6% decrease in vehicle trips (Puget Sound Regional Council, 1994, pp. 25). Source/Reference: WSDOT, 2000, pp. 71.

HOV Facilities

A comprehensive network of HOV facilities can encourage not only the use of public transit, but also the formation of carpools and vanpools. By reducing travel times for transit or rideshare vehicles, HOV facilities allow them to compete more effectively with private vehicles. There are three methods for providing an HOV lane - adding a lane, utilizing the existing shoulder, and converting an existing general purpose lane to HOV only. HOV lanes are estimated to reduce peak period trips on congested facilities by 2-10% (Ewing, 1993, pp. 343-366). HOV lanes can provide up to a 2% trip reduction and a 1.5% reduction in daily region-wide VMT (Apogee Research, Inc., 1994). Source/Reference: WSDOT, 2000, pp. 15-17.

Information Technology Applications for Transit and Ridesharing Modes

Telecommunication and computer technologies are providing opportunities for innovative TDM programs, and future advances will provide even more options. For example, by collecting information from a variety of

service providers (traffic conditions, bus schedules, carpool and vanpool opportunities) and presenting it to the user in one place (telephone system, public kiosk, website), ATIS (Advanced Traveler Information Systems) makes travel information more accessible. Telephone or desktop computer interfaces can allow users to tap into a rideshare agency's matching computer to automatically learn of, and communicate with, potential carpool partners (dynamic rideshare matching). This added flexibility potentially redefines carpooling - from a permanent arrangement with a set group of commuters to something that changes daily according to one's need. Source/Reference: WSDOT, 2000, pp. 63-64.

Jobs-Housing Balance Programs

Jobs-housing balance programs are crucial to effecting efficient urban development patterns as part of an urban containment strategy. Failure to improve jobs-housing balance will result in inefficient development patterns and fundamentally undermine the very purpose of growth management to direct development where it is appropriate and away from areas where it is inappropriate. In order to be effective, jobs-housing balance programs must emphasize not only a balance between work and housing, but more importantly, a balance between work and housing that workers can afford. Strategies used to achieve the desired balance include mixed-use requirements, affordable housing density bonuses, linkage programs, and public-private partnerships. "Balanced jobs-housing" cities averaged 12 to 15% less work-trip VMT per employed residents that did "job-surplus" cities (Cervero, 1996b). Case/Example: Sacramento County (CA), Costa Mesa (CA), Program of Southern California Association of Governments (CA), and Durham (OR). Source/Reference: Nelson and Duncan, 1995, pp. 84-85; U.S. EPA, 2001, pp. 64.

Job Access and Reverse Commute Program

The Job Access and Reverse Commute grant program assists states and localities in developing new or expanded transportation services that connect welfare recipients and other low income persons to jobs and other employment related services. Job Access projects are targeted at developing new or expanded transportation services such as shuttles, vanpools, new bus routes, connector services to mass transit, and guaranteed ride home programs for welfare recipients and low income persons. Reverse Commute projects provide transportation services to suburban employment centers from urban, rural and other suburban locations for all populations. Source/Reference: FTA, A.

Land Use Expert Panels

Maryland DOT's State Highway Administration has used land use expert panels on three projects when important questions arose about the links between the characteristics of a planned road project and local environmental and land use priorities. This approach required the formation of a panel of outside professionals (real estate experts, developers, environmentalists, bankers, experts in growth management and local planners) who aided in the development of alternative, policy-based land scenarios as the basis for project planning, and who helped consider whether land uses were likely to change as a result of planned transportation improvements. Case/Example: Land Use Expert Panels of State Highway Administration (in Maryland DOT). Source/Reference: Maryland DOT, A.

Light Rail Transit (LRT) Investments

LRT can operate on city streets in downtown areas like a bus, providing passengers convenient stops close to work, shopping, and entertainment. Outside the downtown area, LRT operate like a passenger train on a private right-of-way, traveling at speeds up to 55 mph between stations. The impact of light rail on land use and economic development most likely occurs over the intermediate to longer term. Light rail, by itself, may not be a cause for land-use changes or economic development. As a tool, it can best facilitate land use changes and economic development when integrated within a comprehensive land use, economic development and transportation plan. Case/Example: MAX system of Portland (OR) and Hiawatha Light Rail Transit on Construction of Minneapolis/St. Paul (MN). Source/Reference: Greater Austin Chamber of Commerce Staff, 2000, pp. 21; Minnesota DOT, A.

Live Near Your Work Program

Maryland's Live Near Your Work (LNYW) pilot program provides a minimum of $3,000 in direct cash assistance to home buyers moving to designated neighborhoods surrounding major employers. Local governments designate the LNYW areas and administer the program within their jurisdictions. The following three benefits of the LNYW program are expected: 1. Neighborhoods are strengthened through increased homeownership; 2. Commuting costs are reduced; and 3. Important relationships are forged between employers and their surrounding communities. Participating employers - businesses, non-profits, colleges or universities, or government agencies - must set eligibility requirements, promote the program to their employees and provide matching resources. Case/Example: Maryland's LNYW program. Source/Reference: Georgia DCA, 1998, pp. 25; Maryland Office of Planning, 1997a, pp. 6; Maryland Office of Planning, 1997b, pp.14.

Location-Efficient Mortgages (LEMs)

Linking transportation and housing policy makes good financial sense. To the degree less is spent on transportation, more income is freed up for housing consumption. The concept of Location Efficient Mortgages (LEMs) has gained currency. If the homebuyer purchases a home in areas that are well-served by transit, they are assumed to be saving money by foregoing auto expenses. This money is counted as income, thus allowing them to qualify for a larger mortgage and buy housing in closer-in areas. LEMs are also good for developers, who gain a larger market by building housing in transit supportive areas. Demonstration programs, co-sponsored by Fannie Mae (federal mortgage insurance agency) and several private banks, are currently under way or being implemented in Chicago, Seattle, San Francisco Bay Area, and Los Angeles. Case/Example: LEM program of Seattle (WA). Source/Reference: Cervero, 2000, pp. 12; WS DOT, 2000, pp. 53-54; Goldstein, 1996.

Main Street Program (Downtown Revitalization)

The Main Street program is designed to improve all aspects of the downtown or central business district, producing both tangible and intangible benefits. Improving economic management, strengthening public participation, and making downtown a fun place to visit are as critical to Main Street's future as recruiting new businesses and rehabilitating buildings. Building on downtown's inherent assets - rich architecture, personal service, historic culture and traditional values and most of all, a sense of place - the Main Street approach has rekindled entrepreneurship, downtown cooperation and civic concern. Case/Example: Main Street Programs in

Maine, Maryland, and North Carolina. Source/Reference: National Main Street Center.

Monetary Incentives of Employers for Alternative Mode Use

Many employers have found it simple and effective to encourage the use of HOVs or transit by providing their employees with a monetary incentive to do so. Monetary incentives most often take three forms: 1. direct subsidies for transit passes, use of employer vehicles for ridesharing, and parking for HOVs; 2. transportation allowances (employers are free to use this money to pay for parking or transit, or as additional income.); 3. parking cash-outs (parking is considered a workplace benefit, and those employees who do not use it are entitled to instead receive its monthly value.). A reduction in trips of between 8% and 18% can be expected at individual employment sites (Comsis Corporation, 1993b. pp. 3-21). Parking cash-out programs could reduce SOV commuting trips by as much as 24% (Wilson and Shoup, 1990). Source/Reference: WSDOT, 2000, pp. 23-24.

Neighborhood Conservation Program

The Maryland DOT's neighborhood conservation program provides funding for transportation improvements on roadways and other transportation facilities located in state designated neighborhoods (often referred to as neighborhood revitalization areas) where the improvements will promote economic revitalization and neighborhood conservation and where these improvements will contribute to other revitalization activities. Eligible components include roadway repaving or reconstruction; roadway signing, lighting and traffic controls; conventional sidewalks; bus shelters and transit station access improvements; streetscaping; and etc. Case/Example: Maryland DOT's Neighborhood Conservation/Urban Reconstruction Program. Source/Reference: Maryland DOT, C, pp. 4-5.

Non-Motorized Mode Facility Support

A Harris poll for Bicycling Magazine in 1991 indicated that 46% of people 18 and older had ridden a bicycle in the previous year. Of these, up to 53% said they would commute to work if better facilities were available. 59% of all respondents reported that they would walk or would walk more if there were safe, designated paths or walkways (FHWA, 1994). Supportive actions include adding and improving paths and bike lanes, providing safe routes to school; providing bicycle carriers on buses; installing bicycle racks, lockers, and changing/shower facilities at Park & Ride lots; and much more. Increasing the walk mode share by 1% would reduce commute trips by 0.5%, and increasing the bike mode share by 1% would reduce commute trips by 0.9% (Comsis Corporation, 1993a, pp.4-31). Source/Reference: WSDOT, 2000, pp. 13-14.

On-Site Facility Amenities Provision

Facility amenities include the physical changes that can be made to an employment facility to employees. Amenities that are trip generators such as daycare centers, bank offices, restaurants, gyms, and coffee/newspaper shops are situated on-site. The effectiveness of on-site amenities provision may be comparable to that of mixed-use development. Establishing private businesses in employment centers/sites may require proof of profitability, and local zoning regulations may prevent or make difficult their implementation. Source/Reference: WSDOT, 2000, pp. 31-32.

Park & Ride Lots

People drive to the Park & Ride lot in the morning, park their car and transfer to a transit to get to work. Park & Ride lots are not restricted to car to transit transfers - they also serve as meeting points for carpools and vanpools and accommodate walk-in or bike-in trips. Lots such as this function more as transit hubs. With the addition of services such as daycare, banks, or markets, Park & Ride lots can free users from the need to make additional errand trips before or after work. Source/Reference: WSDOT, 2000, pp. 19-20.

Parking Demand Management

The demand for parking can be managed through pricing strategies. Parking pricing can be implemented at the employment site, with metered spaces on the street, in commercial parking lots, at destination lots such as shops, malls, parks, public facilities, or through a parking tax to manage demand for parking space. Charging for parking is one of the most effective TDM strategies. Pricing studies indicate that region-wide parking charges can result in a 1-5% reduction in VMT and vehicle trips (PSRC, 1994. pp. 25). In the study of individual employment site, SOP (Single Occupant Vehicle) reductions ranging from 12 to 25% after the elimination of free parking (Comsis Corporation, 1993a. pp. 4-9). Source/Reference: WSDOT, 2000, pp. 69-70.

Parking Supply Management: Flexible Requirements

Flexible parking requirements permit developers to reduce the number of parking spaces provided in exchange for actions such as transit/pedestrian supportive land uses, mixed-use development, provision of bicycle parking, preferential carpool parking, placement of carsharing vehicles on site, shared parking agreements, fees paid in lieu of on-site parking, reductions in off-street parking requirements, etc.. See Washington State Commute Trip Reduction Office, 1999 for an overview of parking policy. Case/Example: HOV parking requirements of Seattle (WA); Placement of parking behind buildings of Everett (WA). Source/Reference: WSDOT, 2000, pp. 47-49; Washington State Commute Trip Reduction Office (in WSDOT), 1999.

Parking Supply Restrictions

A locality can limit overall supply of parking in an area through combined policies targeted to an overall cap. Experience with parking cap policies has been limited and mixed with other transportation policies making it difficult to determine effectiveness with confidence. Portland and San Francisco provide the two relevant cases where it appears the policies possibly are effective in increasing or maintaining transit use. In 1975, the City of Portland set an overall cap of approximately 40,000 parking spaces downtown, including existing space, approved but not built spaces, and a remainder termed “reserve” from which space for new development is allocated. The cap moved up to about 44,000 spaces by the late 1980’s, and has moved up again recently with the implementation of new simultaneous efforts (termed “offsets”) to reduce vehicular traffic. Thus, the case represents a moving rather than fixed cap. The City is generally satisfied with its parking policies and believes it has helped increase transit use from 20 to 25 % in the early 1970’s to a level of 48 % in recent years. The carpool rate is 17 % (Higgins, 1989). Case/Example: Portland (OR) and San Francisco (CA). Source/Reference: FTA, B.

Performance Measurement Adoption

In 2000, the Maryland Legislature approved legislation requiring Maryland DOT to adopt performance measures that support evaluation of MDOT's success in meeting the goals laid out in the Maryland Transportation Plan (MTP), the overarching policy document that guides all of MDOT's activities. To advise MDOT on the adoption of performance measures, the legislature established a task force that would recommend a set of suitable measures for the Department to adopt. The task force completed its deliberations in Fall 2001, and the Department is evaluating how to implement the recommended measures. Because the MTP includes land use and smart growth goals, the recommended package will include measures that relate to smart growth and transportation-land use linkages. The package may also include recommendations for the development and/or refinement of additional measures through joint work with interested local jurisdictions, other state agencies, and relevant stakeholders. Source/Reference: Maryland DOT, A.

Public Education and Promotion for Alternative Modes

Public education complements every other TDM strategy by creating a climate that fosters public acceptance and awareness of alternative transportation modes. It is a vital element of a TDM project. Public education campaigns coordinated by a variety of entities, both public and private, are ongoing in most major cities in the U.S. As examples, there are modes of information dissemination such as bike maps and bus schedules; marketing/campaign through the use of mass media; designation of Bike-to-Work Week, Ozone Action Day, Relax Statewide Transportation Choices campaign, Oil Smart campaign, Rideshare Week, One Less Car campaign, Walk to School days; and others. Source/Reference: WSDOT, 2000, pp. 3-4.

Rail-Based Transit-Oriented Development (TOD)

Maryland DOT defines a TOD as a place of relatively higher density that includes a mixture of residential, employment, shopping, and civil uses and types located within an easy walk of a bus ("Bus-Based TOD") or a rail transit center ("Rail-Based TOD"). Eight strategies that are fundamental to any smart growth planning for a TOD include: 1. maximizing ridership; 2. increasing property values; 3. increasing tax revenues; 4. providing retail opportunities; 5. offering an alternative to auto-dependent developments; 6. providing a stimulus for the revitalization of urban centers and existing neighborhoods; 7. providing choices; and 8. supporting environmental quality. The following categories of challenges and barriers of TOD implementation are: local planning, zoning and code issues; developer costs and risks; location and market issues; public perceptions and acceptance; and government, institutional and policy issues. Planned Unit Development (PUDs) have several similarities, being site specific master plans with a high design content, but PUDs have typically been individual projects that make few connections to transit. As an case of a TOD, Transit Station Area Development Incentive Program (Smart Growth Transit Program), run by the Maryland Department of Transportation in coordination with the Maryland Department of Planning and other departments, provides funds for services and amenities that stimulate private investment adjacent to major transit facilities. Case/Example: Transit Station Area Development Incentive Program and Transit Station Smart Growth Initiative (MD). Source/Reference: Maryland DOT, 2000, pp. 4-7; ARC, A.

Road Pricing: Toll Roads

The concept of toll roads is not new, but in the past tolls have been used to pay for construction/maintenance costs rather than strategies for trip reduction or congestion management. Price elasticity of tolls ranges from -0.1 to -0.4 for urban highways in the U.S. That is, 10% increase in toll rates results in a 1-4% reduction in vehicle use. Source/Reference: WSDOT, 2000, pp. 73-74; VTPI, A; VTPI, B.

TGM Code Assistance

The Oregon TGM code assistance services help communities modify their development ordinances, comprehensive plans, and development review procedures to allow and encourage smart development patterns. Case/Example: Oregon TGM Smart Development Code Assistance. Source/Reference: Oregon DOT & DLCD, D.

TGM Consultants

The Quick Response Program (Oregon TGM consultants) provides planning and design services to help developers and communities create compact, pedestrian-friendly, and livable neighborhoods and activity centers. In response to local requests, property owners, local and state officials, and affected stakeholders come together to review development proposals, develop innovative design solutions, and overcome regulatory obstacles to land use, transportation, and design issues. Case/Example: Oregon TGM Quick Response Program. Source/Reference: Oregon DOT & DLCD, C.

TGM Grants

Since the 1993-1995 biennium, the Oregon TGM program has distributed $21.6 million in planning grants to local governments to accomplish transportation-efficient planning. In the 2001-2003 biennium, grants of approximately $4.9 million have been awarded to local jurisdictions for projects in two categories: 1. Transportation System Planning and 2. Integrated Land Use and Transportation Planning (grants to help local governments develop integrated land use and transportation system plans that promote compact, mixed-use, pedestrian-friendly development and reduce reliance on the automobile.) Case/Example: Oregon TGM Grants. Source/Reference: Oregon DOT & DLCD, B.

TGM Outreach Program

The Oregon TGM Outreach program is aimed at increasing the understanding and acceptance of smart development principles through things like workshops, a partnership program and technical assistance for practitioners. Maine DOT is also looking at creating tools and outreach programs that would link transportation and land use for local decision makers. Case/Example: Oregon TGM Outreach Program. Source/Reference: Oregon DOT & DLCD, E.

Traditional Neighborhood Development (TND)

In the 1960s, new towns and communities were viewed as necessary to better manage urban sprawl and also to divert attention away from the many failures of urban renewal. In recent years, the traditional neighborhood development (TND) has come to be viewed as a new community planning concept. TND is the term used to describe the planning and urban design of new developments that take their urban forms from the structure and layout of pre-automobile neighborhoods. The five main organizing principles are: 1. compact, defined urban

neighborhoods, comprising a compatible mix of uses and housing types; 2. a network of connected streets with sidewalks and street trees to facilitate convenient and safe movement throughout neighborhoods for all modes of transportation; 3. focus on the pedestrian over the automobile; 4. integration of parks and public spaces into each neighborhood; and 5. the placement of important civil buildings on key sites to create landmarks and a strong sense of place. In practice, new communities fall neatly into four categories: self-contained, urban node, infill, and isolated resort. The self-contained communities are designed to be self-sufficient in terms of offering enough jobs, shopping, leisure, and housing opportunities for all residents. The urban node-communities are primarily residential and shopping areas with relatively little employment but are tied to rail lines either directly by locating near transit stations or indirectly by dedicated minibus service. Nelson and Duncan (1995, pp 91-92) summarize the general criteria for reviewing new communities in a growth management context. Case/Example: Miami Lakes (FL), Columbia (MD), and Reston (VA) for self-contained communities; Kentland (Washington, DC metro area) for an urban node-community. Source/Reference: ARC, B, pp. 1; Nelson and Duncan, 1995, pp. 88-92.

Traffic Calming

Traffic calming includes a variety of techniques designed to balance the needs of all road users. Techniques for keeping cars moving at speeds that are safe for other road users include T-intersections, on-street parking, brick paving, zig-zag curves, narrowings, raised crosswalks, speed humps, chokers, diverters, median islands, channelization islands, chicanes, stop signs, neotraditional street design, street trees etc. For example, Gainesville, Florida has installed mini-traffic circles in its neighborhoods, and closed many residential streets to outside traffic. Source/Reference: Ewing, 1997, pp. 68-69; Victoria Transport Policy Institute

Transit Fare Adjustment

Many transit agencies use zone-based fares, peak period fares, bus passes, ride-free zones, and special fares for different user groups. The price elasticity of demand for transit is commonly estimated to be -0.3, meaning that a 50% reduction in transit fares will result in a 15% increase in transit ridership. Improving other factors such as the availability, quality, and/or frequency of transit service effectively complements the strategy of transit fare adjustments. Demonstrations of low or free transit fares in urban areas (Denver, Boston) have estimated area-wide VMT reductions of approximately 2%. The Puget Sound Regional Council estimates the potential vehicle trip reduction for transit service fare changes at 1.8% (PSRC, 1994. pp. 24-32). Case/Example: Denver (CO) and Boston (MA). Source/Reference: WSDOT, 2000, pp. 77-78.

Transportation and Growth Management (TGM) Joint Program/Consortium

The Transportation and Growth Management (TGM) program is the joint program/consortium between a state department of transportation and a state agency of land use development and growth management. For example, the Oregon TGM program is the joint program between the Oregon Department of Transportation and the Department of Land Conservation and Development. The TGM program provides non-regulatory technical assistance and grants funding to local communities. Total funding for the joint TGM program during the 1999-2001 biennium is $11.2 million. Of that, about $9.9 million came from federal transportation funds and the remaining $1.3 million is from state general funds. The TGM program offers four main services to Oregon communities: 1)

grants to local governments; 2) Quick Response Team; 3) smart development code assistance; and 4) educational outreach.(See TGM Grants, TGM Consultants, TGM Code Assistance, and TGM Outreach Program.) Case/Example: Oregon TGM Joint Program. Source/Reference: Oregon DOT & DLCD, A.

Transportation Enhancements Program

The Federal Transportation Equity Act for the 21st Century (TEA-21) provides funds for transportation-related enhancements. Projects may include bicycle and pedestrian facilities, safety and educational activities for pedestrians and cyclists, acquisition of scenic easements and historic sites, scenic or historic highway programs, preservation of abandoned railway corridors, and so on. Source/Reference: Maryland DOT, A; Maryland DOT, C, pp. 8-9.

Transportation Management Associations

Transportation Management Associations (TMAs) are nonprofit member organizations of businesses and developers (and sometimes local jurisdictions, state government, and transit agencies) dedicated to solving transportation concerns within a specific geographic area. In a more formalized way TMAs generally offer employers a combination of four types of activities: 1. Information, training, and education; 2. Direct facilitation of TDM services such as ridematching, vanpools, and guaranteed ride home; 3. Advocacy for new and improved transportation/transit services; and 4. Assistance in complying with local transportation and air quality regulations. Most TMAs are public-private partnerships and can reduce employers' costs to implement work site programs. Source/Reference: WSDOT, 2000, pp. 33-34.

Trip Reduction Ordinances and Programs

Trip reduction ordinances (TROs) require developers, employers, or building managers to provide incentives for occupants or employees to use alternative modes. Ordinances can be implemented state/region wide or by local jurisdictions and take many different forms. Ordinances can require a certain reduction in trips with penalties and rewards set for achievement or nonattainment of goals. Other trip reduction programs function on a voluntary or community-based basis. Large companies and commute trips in congested areas are usually the targets of TROs. Washington's Commute Trip Reduction (CTR) law is similar to TROs. Oregon's ECO (Employee Commute Options) program requires employers with over 50 employees to reduce drive-alone rates. Case/Example: Commute Trip Reduction Law (WA); Employee Commute Options Program (OR). Source/Reference: WSDOT, 2000, pp. 57-58.

Vanpooling and Ridematching Services

Vanpooling is a travel mode that brings five to fifteen commuters together in one vehicle - typically a van. In Puget Sound Region, vanpooling has achieved a 2% share of the overall commute market. Among commuters who travel over 20 miles each way, vanpooling has reached a 7% market share. Employers frequently subsidize vanpool fares for their employees. IRS regulations allow transit or vanpool subsidies of up to $65 ($100 in 2002) per month, tax-free for employees. Washington State law exempts vanpool commutes from workers' compensation insurance coverage, and the purchase of a van for vanpooling is exempt from the state sales tax or use tax in the case

of a lease. Case/Example: Puget Sound Region (WA). Source/Reference: Office of Urban Mobility, 2000; WSDOT, 2000, pp. 5-6 and pp. 9-10.

Worksite Parking Management

Aggressive parking management programs are possibly the single most effective TDM measure an employer can take to reduce SOV travel. Parking management can take many forms: 1) preferential parking for HOVs/Vanpools (giving carpools or vanpools priority); 2) parking cash-out programs (a cash benefit given to employees); 3) limiting parking supply; and 4) parking pricing (charging the same rate for all vehicles which effectively makes carpools cheaper). Priority parking schemes have a very minimal impact on mode split, but charging for parking can create 20% to 30% reductions in SOV mode share, depending on pricing levels and transit access (Johnston and Ceerla, 1995, pp. 9). Source/Reference: WSDOT, 2000, pp. 29-30.

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Appendix B-2

Description of Growth-Management Policy Actions for Mitigating Urban Sprawl

Adequate Public Facility (APF) Standards/Requirements

APF requirements are formal mechanisms used to enforce one of the most fundamental tenets of land use planning - that development should not be permitted where it cannot be adequately accommodated by critical public facilities and services (i.e., minimum required levels of service for water, sewer, drainage, and traffic flow). From Florida to Washington State, APF standards are increasingly used to ensure that urban growth does not overburden municipal facilities and reduce current service. APF ordinances encourage infill development, facilitate municipal service delivery, and direct development toward facility-rich areas. Case/Example: APF Requirements of Florida. Source/Reference: NACo, JCSC, and SGN, 2001, pp. 30-31.

Agricultural and Forest Programs

Agricultural zoning, including forestry zoning, is the most common method of resource land preservation used by local governments. Such zoning restricts land uses to farming and livestock, other kinds of open space activity, and limited home building. Hawaii and Oregon require the use of agricultural zoning by all local governments that have prime agricultural farmland. The most important element of agricultural zoning is the extent to which it restricts the intrusion of new, nonfarm uses into established agricultural areas. Four general approaches to resource-land-use zoning are: nonexclusive use zoning, voluntary agricultural districts, exclusive use zoning, and agricultural buffers. Case/Example: Agricultural zoning of Hawaii and Oregon. Source/Reference: Nelson and Duncan, 1995, pp. 51-54.

Annexation

Most states authorize their municipalities to annex territory to retain some control over urban development. The political possibility of exercising this power, however, varies from state to state. Some states, such as North Carolina and Texas, require only that the city provide or commit to providing urban services in the area annexed. Other states have established elaborate annexation procedures that require affirmative votes from residents of the annexing jurisdiction, the jurisdiction losing territory, and the residents of areas to be annexed - a difficult test in many growing urban areas. Case/Example: Specific Plan in Tracy (CA). Source/Reference: Porter, 1997, pp. 71-72.

Brownfield Redevelopment

Brownfields are abandoned, idled, or underused industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental consequences. Brownfields, like infill sites, have the potential to absorb significant amounts of development. Brownfields in Detroit, Chicago, Milwaukee, and Cleveland could absorb 1 to 5 years of residential development, 10 to 20 years of industrial development, or 200 to 400 years of office space (Simons, 1996). Brownfield sites are different from other urban infill sites because of uncertainties about environmental liability and clean-up costs. Site owners, developers, and lenders often avoid investing in brownfields because of fear of contamination and the costs associated with it. Source/Reference: U.S. EPA, 2001, pp. 38.

Capital Improvement Programs (CIPs)

Capital improvement programs (CIPs) establish a schedule and funding basis for extending and improving facility systems (e.g., streets, water and sewer lines, septic systems, schools, libraries, parks, and other common facilities). If well linked, coordinated, and constantly updated, these ways of managing infrastructure can be effective. Yet many communities find that they must rely on other means to ensure that infrastructure development corresponds to other aspects of community development, especially in meeting funding requirements. Many communities use some or all of the techniques – functional plans; adequate public facility (APF) requirements (See APF standards/requirements.); exactions, impact fees, and special districts for these purposes; and so on. Source/Reference: Porter, 1997, pp. 25-26 and pp. 47-49.

Carrying Capacity Limitations

Carrying capacity is a term borrowed from the ecological sciences. Carrying capacity systems attempt to identify the upper capacity limits of the natural and built environment of a defined geographic area. The notion of carrying capacity usually focuses on natural systems. Man-made systems, however, are also characterized by capacity limitations. Critical population thresholds, roadway networks, water and wastewater systems, and even social systems such as fiscal resources or school systems can be identified that indicate when excess demand is being made on systems. Case/Example: Sanibel (FL). Source/Reference: Nelson and Duncan, 1995, pp. 95 and pp. 110-111.

Cluster Development

In newly developed areas, clustering development into concentrated areas can protect natural habitat. Cluster developments are built at gross densities comparable to conventional developments but leave more open space by reducing lot sizes. Square footage of buildings and residential and commercial capacity may remain the same, but compact clusters reduce the dimensions and geometry of individual lots and shorten road lengths. One of the main advantages of cluster development as a conversion tool is that it does not take development potential away from developers, since it changes the arrangement but not the number of units permitted on a property. It can also reduce costs for developers by requiring fewer miles of roads and water and sewer lines. Source/Reference: US EPA, 2001, pp. 39.

Compact Development

Compact metropolitan development generally means that the space needs of a population can be satisfied with less land area. Compact development can take various forms, and communities can develop more compactly by using three techniques: infill development, brownfields redevelopment, and cluster development. See Infill Development, Brownfields Redevelopment, and Cluster Development. Source/Reference: US EPA, 2001, pp. 37.

Comprehensive Plan Consistency Requirements

A comprehensive plan consistency requirement ensures that all local zoning and land use decisions made by the governing body are consistent with the local comprehensive plan. Several states have included this mandate as part of state planning and zoning legislation. Source/Reference: Georgia DCA, 1998, pp. 24.

Comprehensive Plans

Comprehensive plans include "community vision," "information and projections (an inventory of what currently exists and what growth in population and land use is expected)," "land classification and zoning," "economic development," "residential areas," and "facilities and infrastructure (Local officials need to know the capacity of current infrastructure and where they anticipate locating future facilities or extensions. A comprehensive plan can assist communities in determining the appropriate timing and location for infrastructure repair and extension)." To be effective, they must be updated regularly. However, many comprehensive plans are outdated and cannot adequately guide new development, respond to growth pressures, and carry out the community vision. Case/Example: Seattle Municipal Plan, "Toward a Sustainable Seattle" (WA); Chester County Land Use Plan (PA); and Lincoln/Lancaster County Joint Comprehensive Plan (NE). Source/Reference: NACo, JCSC, and SGN, 2001, pp. 9-10.

Conservation Easements

Conservation easements involve the transfer of development rights from a property owner to a third party, such as the Conservation Foundation. Conservation easements enable landowners to retain title to an undivided tract and use it for resource purpose. The advantage to the landowner is reducing the value of land to its inherent value for resource activities. For many landowners, this enables them to continue living on their land without facing higher property taxes. It also gives them the altruistic opportunity to preserve resource lands as open space in perpetuity. Local government can play a role in facilitating conservation easements by putting third parties active in acquiring them in contact with potentially receptive resource landowners. Source/Reference: Nelson and Duncan, 1995, pp. 51.

Cost-based Utility and Stormwater Fees

Cost-based Utility and Stormwater Fees are essentially extensions of impact fees in which utilities and municipal taxes are lower for infill development than for urban sprawl locations, due to higher public service costs. The City of Austin, Texas Smart Growth program includes an incentive matrix for infill development in its desired development zone and downtown that includes a sliding scale of reductions in fees and taxes for certain development types and locations that are consistent with their Smart Growth priorities. Source/Reference: City of Austin 2002, http://www.ci.austin.tx.us/smartgrowth/smartmatrix.htm

Cross-Acceptance Process

The cross-acceptance process is the process of comparing the planning policies of different governmental levels in order to attain compatibility between local and state plans. The process is designated to result in written statements that specify areas of agreement or disagreement between local plans and a preliminary state plan. This consensus-building approach was adopted by the State of New Jersey as a way to achieve vertical plan consistency while preserving local home rule. Case/Example: New Jersey's Cross-Acceptance Process. Source/Reference: Georgia DCA, 1998, pp. 24; New Jersey OSP, A.

Development Caps and Rate Allocation Systems

Rate-of-growth systems typically have annual development caps similar to growth-phasing systems (See Growth-Phasing Systems.), but are less closely linked to public facility constraints. Development caps represent an attempt to set an absolute upper limit on development within a community or some portion of an area, such as Boca Raton (FL)'s 40,000 dwelling unit caps. Development caps are usually accompanied by a carrying capacity analysis. Historically, caps and allocation systems have been enacted by communities experiencing rapid population growth and extreme development pressures. Development rate allocation systems are the growth management systems that set limitations on the total amount of development allowable within a certain time period. Depending on the community's growth management goals and the purpose of the regulation, most rate allocation systems place an annual cap on the total number of new residential units or commercial space allowable in a community over a period of one to three years. Petaluma (CA) limits the total number of new residential units to a 500 annual average not to exceed 1,500 over a three-year period. Case/Example: Development Caps of Boca Raton (FL); Development Rate Allocation Systems of Boulder and Aspen (CO) and Petaluma (CA). Source/Reference: Nelson and Duncan, 1995, pp. 105-110; Georgia DCA, 1998, pp. 24.

Development Exactions

Development Exactions often require developer contributions of land, facilities, or funding for certain types of public facilities that may serve more than the developer's project or be located off site. Typical exactions include the dedication of land such as park land, school sites, and road rights-of-way and public facilities such as widening the portion of a substandard street. Nelson and Duncan (1995, pp. 119) divide exactions into four broad categories: mandatory land dedication requirements, negotiated exactions, impact or linkage fees (See Impact Fees.), and development taxes. A major limitation common to the first two types of exactions is that they tend to address only those public improvements that are either on-site or in close proximity to the development. Case/Example: North Carolina and Virginia (negotiated exactions tightly regulated in a state-level). Source/Reference: Nelson and Duncan, 1995, pp. 118-120; Porter, 1996, pp. 10-11.

Development Policy Areas

Known by several terms, including tiers, development policy areas are typically designated to maintain and/or redevelop existing urbanized areas, continue urbanization in developing areas, reserve land for future urbanization, and preserve land for open space, agricultural production, or environmental protection. Policy areas then provide a framework for other planning and zoning requirements. The standard version delineates an "urban" area of established neighborhoods and centers, "urbanizing" areas where most new development will take place, and an "urban reserve" area where open space is preserved until some future date. Source/Reference: Porter, 1997, pp. 44; Porter, 1996, pp. 8.

Developments of Regional Impact (DRI)

DRI requires review of development projects that are of sufficient size to have an impact beyond a local jurisdiction. Review is designed to improve communication among governments on large-scale developments and to provide a means of identifying and assessing potential development impact before related conflicts arise. Since DRI review processes provide a mechanism for communication on regional land use issues, the DRI process acts as

a tool for regional growth management. Case/Example: DRI process of Florida. Source/Reference: Georgia DCA, 1998, pp. 24.

Differential Assessment Programs

Differential assessment programs are programs that allow local officials to assess farmland at its agricultural use value, rather than its fair market value. Since fair market values are generally higher, especially in urban fringe areas, differential assessment can be used as a way to encourage farmers to maintain the agricultural use of their land. This provides an incentive to conserve land, thus limiting urban sprawl. Source/Reference: Georgia DCA, 1998, pp. 24-25.

Extraterritorial Jurisdiction

Municipalities in many states are given powers to oversee planning and zoning for development in a circumscribed area around their boundaries. These powers vary widely from state to state: "oversee" can mean total control over setting development standards, simply the right to review and comment on rezoning and subdivision proposals, or to prepare plans for the areas involved. Case/Example: Raleigh (NC) and Fresno (CA). Source/Reference: Porter, 1997, pp. 45 and pp. 70-71; Porter, 1996, pp. 13.

Facility Financing

In the face of declining federal assistance and local voter opposition to tax and utility rate increases, cities and counties must turn to alternative techniques to finance growth-related capital facilities. These techniques include development exactions, impact fees, special taxing districts, cost-based utility and stormwater fees, and development taxes. Despite their differences, these funding techniques have a common theme: they shift the costs of new infrastructure from the general public to the new developments that create the need. Source/Reference: Nelson and Duncan, 1995, pp. 112.

Farmland Preservation Credits

Farmland preservation credits are the programs that allow farmers to claim state income tax credits to offset their local property tax bills. The credits encourage farmers to continue farming rather than sell their land for development. This eases the development pressure on exurban land. Source/Reference: Georgia DCA, 1998, pp. 25.

Floating Zones

Floating zones are zoning districts and provisions for which locations are not identified until enacted for a specific project. Such zones are used to anticipate certain uses, such as regional shopping centers, for which locations will not be designated on the zoning map until developers apply for zoning. They usually require special review procedures. Montgomery County (MD) has pursued aggressively the development of higher densities around Metro-rail stations. Of particular value in this effort was the creation of floating zones that permit higher densities in some business areas subject to design review and contributions of amenities. The zoning provisions have been applied particularly in rail/bus station areas to encourage transit-friendly development and a high order of design and appearance. Case/Example: Bethesda transit-station area in Montgomery County (MD). Source/Reference: Porter, 1997, pp. 26 and pp. 38.

Growth Limits/Controls

Growth limits/control programs (including development caps and rate allocation systems, carrying capacity limitations, and moratoriums) typically impose quantitative limits or quotas on residential and/or non-residential development, whereas growth management seeks to accommodate growth while directing the location and pattern of new development. Historically, caps and allocation systems have been enacted by communities experiencing rapid population growth and extreme development pressures. Many California and Colorado communities and some local jurisdictions in other states have adopted growth limits/controls. Source/Reference: Porter, 1996, pp. 9; Nelson and Duncan, 1995, pp. 105-111.

Growth-Phasing Systems for Public Facilities

Growth-phasing systems (more closely linked to "public facility constraints," as compared to development caps) are an attempt to address some of the shortcomings of performance-based adequate public facilities (APF) systems. Unlike APF requirements that are administered on a project-by-project basis, growth-phasing systems limit the amount of new development that can be approved "over a certain period of time," typically one year. The capacity of a community to absorb growth is a measure that requires continual updating. The factors used to measure compliance with growth-phasing controls must be updated and reevaluated on a regular basis, even though the basic level of service standards by which conformance is measured remain unchanged. Septic system management is part of the equation of Growth-Phasing Systems. Case/Example: Montgomery County (MD), San Jose (CA), Westminster (CO), and Livermore (CA). Source/Reference: Nelson and Duncan, 1995, pp. 100-105.

Horizontal Plan Consistency Requirements

Horizontal plan consistency requirements are the state requirements for uniformity between the plans of adjacent local jurisdictions. Horizontal plan consistency ensures that local governments plan beyond their borders and regulate with adjacent jurisdictions in mind. Consistent local plans can help to ensure uniform regional development standards and efficient regional public facility provision. Horizontal plan consistency is normally achieved either by giving a state or regional organization the authority to require local governments to amend their plans to achieve consistency or by providing a communication process whereby local jurisdictions consult one another about extraterritorial land use issues. Source/Reference: Georgia DCA, 1998, pp. 25.

Impact Fees

Impact fees (also known as development impact fees, system development charges, and the capital expansion component of connection charges) are one-time fees imposed on new development, often to fund off-site public facilities necessitated by that development. Unlike many other financing options, impact fees can encourage efficient development patterns as well as raise revenue. Jurisdictions can use impact fees as a positive growth management tool by encouraging growth (through the use of lower fees) in areas already served by public facilities and discouraging growth (through the use of higher fees) in areas without infrastructure. San Diego is a leading example of this practice. Case/Example: San Diego (CA). Source/Reference: Nelson and Duncan, 1995, pp. 120-124; Porter, 1996, pp. 11.

Inclusionary Zoning

Many communities employ inclusionary zoning practices to avoid exclusion of low-income housing. These strategies include removal of exclusionary barriers and provision of affordable and fairshare housing. The states of California, Florida, New Jersey, and Oregon require forms of inclusionary zoning in local plans.

Source/Reference: Nelson and Duncan, 1995, pp. 83.

Infill Development

Infill development occurs in locations where some development has already taken place and infrastructure is already in place. In urban areas, infill development is typically executed by converting old buildings and facilities into new uses (redevelopment) or by filling undeveloped space within these areas with environmental review exemptions sometimes acting as incentives. Efficiently facilitated infill and redevelopment is needed to ensure that urban areas remain vital, to respond to changing needs when and where needed, and to help dampen urban sprawl pressures. The principle benefits include: making better use of urban land supplies; increasing access of people to jobs, and jobs to labor force; making better use of existing infrastructure and lowering costs of public services; providing affordable housing; promoting economic development (for example, by relocating office buildings to downtowns); reducing the time, money, energy, and air pollution associated with commuting and other use of SOPs; renewing older neighborhoods and housing stock; and preserving historical landmarks. Case/Example: Boulder (CO), Palm Beach County (FL), and Atlanta (GA). Source/Reference: ARC, C, pp. 10; Nelson and Duncan, 1995, pp. 85-87, pp. 148; US EPA, 2001, pp. 37.

Interim Zoning

Interim zoning regulations may be imposed to avoid auto-oriented uses until the time when a specific neighborhood plan can be enacted. The regulations may include any combination of the smart growth zoning approaches.

Interjurisdictional Agreements

Interjurisdictional (interlocal) agreement plays an important role in securing guidance over development outside jurisdictional boundaries. The agreements are allowed in most states to permit agreements between local governments on development plans, standards, and infrastructure extensions in locations of mutual interest. The agreements may be made informally, through such mechanisms as advisory groups, or by formal, signed agreements or compacts, or by contractual understandings for specified services. Case/Example: Raleigh (NC) and Lincoln/Lancaster County (NE). Source/Reference: Porter, 1997, pp. 73-74; Porter, 1996, pp. 13.

Intermediate Growth Boundaries (IGB)

IGBs are short-term development boundaries within long-term containment boundaries. The IGB accommodated development from 1975 to about 1985 (Portland, Oregon), when the IGB was effectively removed and development could extend out to the UGB. Consequently, IGBs are used to prevent the premature development of land located near the UGB before land inside the IGB is first suitably developed. Case/Example: 1976-1985, Portland (OR). Source/Reference: Nelson and Duncan, 1995, pp. 81.

Land Acquisition and Banking

Acquisition of land is the most certain means of preserving the land's environmental and open space attributes. Land Banking is the process of purchasing land or improved property and holding it for future use. This land is normally used to provide land for government services, redevelop previously developed lands, improve local land markets, and recapture land values created by government activities. The most direct and often-used means of acquisition is outright purchase of fee simple ownership by governments or by nonprofit groups that will hold it in trust for conservation purposes. Many states have voted new taxes or earmarked selected revenues to acquire lands for conservation. Local governments frequently pursue their own acquisition strategies to manage growth. While many states set aside funds for fee-simple open space acquisition, it is more common for states to acquire conservation easements and development rights. Easement acquisition is generally cheaper and allows land to remain in private ownership, thus maintaining property tax revenues. Development right acquisition also relieves the public of the responsibility of maintaining the land. Case/Example: Nantucket Island, Massachusetts. Source/Reference: Porter, 1997, pp.45-46; Georgia DCA, 1998, pp. 26.

Minimum Density Zoning/Standards

Minimum density zoning contrasts with the traditional approach to regulating maximum densities. By setting a minimum number of allowable units per acre or maximum lot sizes, zoning can be used to promote compact urban development patterns in areas targeted for higher density growth. For example, the Oregon Land Conservation and Development Commission (LCDC)'s Metropolitan Housing Rule specifically requires of local governments in metropolitan Portland: for cities with projected populations of less than 8,000, the overall housing density must be at least six units per net developed acre by the year 2000. Such a target can be met only by minimum density standards that are either used formally by regulation or informally in review processes. Case/Example: Metropolitan Housing Rule of Portland (OR). Source/Reference: Nelson and Duncan, 1995, pp. 83-84.

Mixed-Use Land Development

Mixed-use development (or mixed land uses) can occur on a number of levels. On a site-specific basis, individual buildings or complexes can be designed to incorporate a variety of uses. At the neighborhood level, mixed-use development refers to the arrangement of different uses across several blocks or acres of land so that they are not physically isolated from one another. At the subregional level, mixed-use often aims to balance jobs and housing so that people have the opportunities to live closer to their places of employment. Mixed-use zoning represents flexible zoning that allows various types of land uses to be combined with a single district. Land use mixing may influence travel demand in a number of ways, but its greatest impact is thought to be on mode choice (Cervero, 1996a, pp. 363). At sites with TDM incentives, areas with a substantially mixed land use had more than double the transit more share of other site, that is, 6.4% share in centers with a substantial mix compared with 2.9% in those with a limited mix (US DOT, 1994). Controlling for other land use and household factors, a doubling in accessibility results in a 7.5% decrease in the number of vehicles owned (Kockelman, 1997). Source/Reference: US EPA, 2001, pp. 59-65; Smart Growth Network, 2000, pp. 43

Moratoriums

Development moratoriums are temporary growth limits, usually halting all further issuances of building permits for a specified period of time. The moratorium can postpone all development or development of a particular type or in a particular area, such as any residential construction, commercial construction along a congested highway segment, or development in a certain school district. It can be a few months in duration or several years.
Case/Example: A six-month moratorium, Calvert County (MD) in 1995, a one-year, Nashua (NH) in the mid-1980s, and an 18-month, San Diego (CA). Source/Reference: Porter, 1997, pp. 80-81.

Overlay Zoning/Districts

Overlay zoning, applied over one or more other districts, creates a second, mapped zone that is superimposed over the conventional zoning districts. Overlay zones typically provide for a higher level of regulations in certain areas such as transit station areas, downtown areas, and historic districts, but may also be used to permit exceptions or less restrictive standards (fewer parking paces in a downtown or transit station area, or more density in an economic development area). Source/Reference: Porter, 1997, pp. 26 and pp. 50; ARC, D, pp. 1-2.

Planned Unit Development (PUD)

The most common form of flexible planning is PUD, which offers options to developers for determining uses, densities, building placement, and other planning and design factors applied to their sites. It allows more flexible site design than ordinary zoning would allow by permitting options or relaxing some requirements. PUD provisions establish overall parameters for development, such as average densities and open space requirements, but allow variable treatment of these factors within a given site. PUDs almost always require special review procedures, including design reviews, to approve these variations from normal requirements. Overlay zoning/districts (See Overlay Zoning/Districts.) can be adopted to provide for special treatment of certain areas such as transit station areas, downtown areas, and historic districts. Source/Reference: Porter, 1997, pp. 26 and pp. 50.

Purchase of Development Rights (PDR)

Government agencies or private land trusts pay landowners for the development rights of a parcel to preserve it from future development. To date, the use of PDR programs is rare. One economic problem with such programs is that they involve taxpayers paying twice for those rights, first through infrastructure investments and development patterns that create development value and again for the value created. Another limitation is that since PDRs are voluntary programs, they suffer from the same limitations as TDRs in not assuring preservation of the critical mass of resource land needed to sustain the regional resource economic base. Case/Example: King County (WA) and Suffolk County (NY). Source/Reference: Nelson and Duncan, 1995, pp. 49-50; NACo, JCSC, and SGN, 2001, pp. 28.

Regional Growth Management Hearing Boards

Regional growth management hearing boards are the quasi-judicial bodies that hear complaints alleging either that a local jurisdiction's plan is not in compliance with state policy or that a local government is not adhering to the local plan. Washington's three growth management hearing boards help to ensure vertical consistency between local government plans and the goals stated in the State Growth Management Act. Case/Example: Growth

Management Hearing Boards (WA). Source/Reference: Georgia DCA, 1998, pp. 26; State of Washington, A.

Regional Planning Councils

A regional planning council is a multipurpose regional entity that plans and coordinates intergovernmental responses to growth related problems. In Florida, regional planning councils are granted the power to prepare regional plans that are consistent with the state comprehensive plan and include ad hoc regional planning organizations. Local governments must in turn adopt local plans that are consistent with the regional plan. Each regional planning council also establishes a dispute resolution mechanism to resolve planning and growth management issues among local governments. Many cities have appointed regional councils with varying amounts of administrative powers (i.e., enforcement and fundraising abilities). Portland, Oregon, is the only city with an elected regional council with legislative powers. Case/Example: Florida Regional Planning Councils. Source/Reference: Georgia DCA, 1998, pp. 26; NACo, JCSC, and SGN, 2001, pp. 14-15; Florida RCA, A.

Regional Service Provider

Giving a single regional agency the authority to oversee the provision of public infrastructure needed to support new development (e.g., water supply, sewage treatment, and roads) can enhance growth management efforts and guarantee a coordinated approach to development through the region. The Portland metropolitan region (OR) provides garbage disposal services, recycling services, a regional park system, regional entertainment facilities, and regional land use/transportation planning services through its regional service provider, Metro. Case/Example: Metro of the Portland metropolitan region (OR). Source/Reference: Georgia DCA, 1998, pp. 26; Metro, A.

Rehabilitation Zoning Codes

In many metropolitan areas, efforts at infill and adaptive reuse of existing building stock can be hampered by modern zoning and building codes that make the regulatory and redevelopment costs too burdensome. In such cases, communities have had to adopt more parallel codes or special ordinances that provide a more flexible performance-oriented approach so that adaptive reuse can occur while still safeguarding the public health, safety and welfare. Case/Example: States of New Jersey and Maryland and the City of Wilmington, Delaware and Denver Colorado. Source/Reference: Maryland's 2000 Infill Guidelines, http://www.mdp.state.md.us/planning/m&gs/01-22.htm

Sensitive Area Zoning

Zoning strategies such as Large Minimum Lot Size, and No Minimum Lot Size go toward land preservation by ensuring that adequate residential development necessary to sustain agricultural/forest development is demonstrated. Buffer Zoning can preserve land by separating rural and residential uses from exclusive resource uses.

Special Financing Districts

Special districts are geographic areas within fees or taxes are collected (in addition to jurisdictionwide general taxes) to fund capital investments or special services that clearly benefit properties within the district. The

distinctive feature of special district is the very close and visible tie between the facility constructed or maintained and those who benefit from and pay for it. Unlike other financial options (such as development exactions or impact fees) that target new development to pay for a share of communitywide improvements, special districts assess and tax all properties in a defined area, developed and undeveloped alike. Due to the diversity of special district approaches (See Nelson and Duncan, 1995, pp. 127-129), generalizations about this flexible technique should be viewed cautiously. Case/Example: Montgomery County (MD). Source/Reference: Nelson and Duncan, 1995, pp. 127-129.

Specific-Area Development Plans

Neighborhood, downtown, and other special-area plans are increasingly popular. To address special planning problems in parts of their communities, local governments often prepare plans for special areas, such as residential neighborhoods, downtown or other business centers, historic preservation areas, and critical areas of environmental significance. Source/Reference: Porter, 1996, pp. 10.

Split-Rate Property Tax

An approach to property taxation where land and its buildings or structures are taxed at different rates, the rate on land being significantly higher that the rate on buildings. The traditional land-building property assessment method (i.e., the assessment method at same rates) creates an incentive for sprawl as local governments seek development to improve land in their community and increase property tax revenues. Landowners in dense areas or near transit have an incentive to build or improve their properties. The split-rate property tax is a valuable tool for commercial revitalization and compact development. It discourages land speculation and increases redevelopment at sites adjacent to infrastructure. This tool may work very similar to site-value taxation. Source/Reference: Georgia DCA, 1998, pp. 27; NACo, JCSC, and SGN, 2001, pp. 36.

State Capital Investment Priorities (Priority Funding Areas)

State capital investment priorities establish criteria for defining the state's "priority funding areas." As a result of a bottom-up process, local governments define the location of all priority funding areas in accordance with the state's infrastructure and economic development investment priorities. Priority funding areas include existing municipalities, areas planned for industrial development, enterprise zones, neighborhood revitalization areas, and any other area where adequate urban infrastructure and services are available. Similarly, New Jersey has "Focused State Investment Plan." Case/Example: Priority Funding Areas (MD) and Focused State Investment Plan (NJ). Source/Reference: Georgia DCA, 1998, pp. 27.

State Development Plans

A state development plan defines state urban development goals and delineates local, regional, and state responsibilities in meeting these goals. Effective state development plans can encourage coordination among all players involved in implementing a state growth management program. New Jersey's State Planning Commission and the Office of State Planning prepare and update the State Plan and ensure that local plans are consistent with the State Plan. In addition to requiring that local plans be consistent with the State Plan, Florida requires all state agencies to adopt a strategic plan that implements some portion of the State Comprehensive Plan. Case/Example:

State development plans of New Jersey and Florida. Source/Reference: Georgia DCA, 1998, pp. 27.

State Policy Assessment

A state policy assessment is a detailed analysis of state agency policies, rules, and regulations to determine whether they are in conflict with the state's growth management goals. The location of state investments, the tax incentives offered to private citizens, the state's land development regulations, and the criteria for receiving state grants all contribute to shaping statewide development patterns. A state policy assessment can be used to identify which of these policies are inconsistent with statewide development goals. State policy assessments can lead to requiring change of the inconsistent policies by executive order of the governor or other means. Source/Reference: Georgia DCA, 1998, pp. 27.

Strategic Policy Plans

As an example, Tampa Bay (FL)'s regional planning council (See regional planning councils.) has the strategic regional policy plan for the nine areas: affordable housing, economic development, emergency preparedness, natural resources, regional transportation, education, people, public safety, and health. The plan includes trends and conditions statements, regional goals, indicators, policies, a listing of regionally significant resources and facilities, and a listing of agencies to be coordinated in implementing the policies. Case/Example: Tampa Bay (FL)'s state regional policy plan. Source/Reference: Tampa Bay Regional Planning Council, A.

Streamlined Permit Processing

The aim of streamlining is to reduce application review times and increase certainty and predictability in the permitting process. Streamlining can take place in several ways (See NACo, JCSC, and SGN, 2001, pp. 60-61; Nelson and Duncan, 1995, pp. 135-136.). Promising approaches to streamlined permitting include permitting deadlines, exemplified by California and Oregon, and special permitting processes, exemplified by Orlando (FL). Case/Example: Permitting deadlines of California and Oregon; Permitting processes of Orlando (FL). Source/Reference: Nelson and Duncan, 1995, pp. 134-137; NACo, JCSC, and SGN, 2001, pp. 60-61.

Targeted Tax Abatement

Targeted tax abatement is a program that encourages certain types of development in targeted areas through property tax reductions. By tying tax abatement provisions to local growth management goals, tax abatement can act as a financial inducement to those developers who wish to build developments that meet objectives established by the community. Property tax abatement can be used to encourage affordable housing, infill development, or job-creating commercial development in economically depressed areas. Source/Reference: Georgia DCA, 1998, pp. 27.

Tax-Base Sharing

Tax base competition encourages cities to overzone for commercial and industrial development and underzone for land uses that do not generate substantial tax revenues. Most tax-base sharing or tax equalization plans redistribute a portion of the increases in property tax revenues to all jurisdictions within a region. Other plans typically call for redistributing the tax increases to jurisdictions according to need-based formulas or population formulas. Also, creating a financial bond across a metropolitan area can be a sure way to build regional

collaboration. Establishing a tax-base sharing program is a daunting task that requires strong local government leadership and broad community support. Case/Example: Minneapolis/St. Paul (MN). Source/Reference: NACo, JCSC, and SGN, 2001, pp. 15-16; Georgia DCA, 1998, pp. 27.

Transfer Development Rights (TDR)

A TDR separates the value of potential development of land from the value of the current use of that parcel and transfers that development value to another site. A TDR program permits owners of land in development-restricted areas called sending districts to sever the development rights from their property and sell those rights to property owners in specified receiving districts. Landowners who purchase development rights are then able to increase the amount of development that can be built on the receiver site. TDRs can be used to save historic structures from demolition, prevent urbanization of farmland, and preserve unique environmental areas and scenic vistas. Case/Example: Montgomery County (MD). Source/Reference: Nelson and Duncan, 1995, pp. 48-49.

Upzoning/Downzoning

One of the principle outcomes of urban containment policies is the reallocation of land to achieve particular results. Upzoning represents selective rezoning of residential land to allow higher density development of single- and/or multi-family housing. If certain rural lands are intended to be used for farming and forestry but are zoned for one-, two-, five-, or even ten-acre minimum lot sizes, their ultimate use will not be farming or forestry but rather small-acreage homesites. Such lands should be downsized to exclusive farm and forest uses with minimum lot sizes (named "Large Lot Zoning"). Case/Example: Ann Arundel County (MD). Source/Reference: NACo, JCSC, and SGN, 2001, pp. 28 and pp. 43; Nelson and Duncan, 1995, pp. 82; Porter, 1997, pp. 108-109.

Urban Containment Strategies

Urban containment strategies represent an attempt to control the spatial pattern of development within a community or region. The benefits of successful urban containment techniques can include greater predictability of the development process, more cost-effective provision of public services, encouragement of infill and redevelopment of existing urban areas, reduction of urban sprawl, and protection of agricultural land and environmental resources. Source/Reference: Nelson and Duncan, 1995, pp. 73.

Urban Development Phasing

When urban development fills in and redevelops inner areas, outer areas must be prepared for future development. For examples, the Twin Cities region (MN) anticipates development needs over a ten-year period by redrawing its urban service limits every five years. Two phasing approaches are used in combination with urban containment boundaries: intermediate growth boundaries and urban development reserves. Source/Reference: Nelson and Duncan, 1995, pp. 81.

Urban Development Reserves

Two phasing approaches are used in combination with urban containment boundaries: intermediate growth boundaries (See, IGBs.) and urban development reserves. Metropolitan Dade County (FL) has a long-term urban growth boundary (UGB) that is designed to meet development needs to about the year 2010. The long term

development plans anticipate the need to expand the supply of buildable land into particular areas located within an urban development reserve. This area has sufficient land to accommodate five to ten years' development when the UGB is filled in. The urban reserves will be managed as to prevent low-density development that could preempt efficient UGB expansion. Case/Example: Metropolitan Dade County (FL) and Metropolitan Portland (OR). Source/Reference: Nelson and Duncan, 1995, pp. 81.

Urban Growth Boundaries (UGBs)

Urban development is allowed within an urban growth boundary, while areas outside the boundary are preserved as rural or agricultural land. UGBs contain development within predetermined areas and preserve the surrounding open space, agricultural lands, watersheds, and other valuable lands. UGBs are generally designated to accommodate growth for a significant period of time - typically 20 years or more and they are updated periodically. The first metropolitan area to establish an UGB was Lexington, KY in 1958, however, Portland (OR, in 1979) is the most well known. Case/Example: Portland (OR) and Lexington (KY). Source/Reference: Georgia DCA, 1998, pp. 28; Nelson and Duncan, 1995, pp. 75; NACo, JCSC, and SGN, 2001, pp. 31.

Urban Service Areas/Boundaries (USAs or USBs)

By defining areas of urban service provision, jurisdictions can avoid unnecessary infrastructure costs associated with extending infrastructure to leap-frog developments and limit the rate of rural to urban land conversion. Generally, USAs are more flexible in expansion than urban growth boundaries because they are drawn mostly consistent with the economics of planned public facilities. Case/Example: Sacramento County (CA). Source/Reference: Georgia DCA, 1998, pp. 28; Nelson and Duncan, 1995, pp. 75.

Vertical Plan Consistency Requirements

Vertical plan consistency requirements are the state requirements for uniformity between local plans, regional plans, and the state plan. Vertical plan consistency requirements help to ensure consistency between state growth management goals and local planning. In states with bottom-up planning, local governments are granted considerable leeway to adopt and forward their own development goals, and the state attempts to develop a state plan that consolidates the goals of the local plans. The state generally acts as a coordinator and mediator of sub-state conflicts. In states with top-down forms of vertical consistency, the state establishes urban development goals that must be implemented by local governments. Source/Reference: Georgia DCA, 1998, pp. 28.

Water Quality Protection Programs

As an example, Austin (TX) has the Water Quality Protection Program. The purpose of the program is to prevent, detect, evaluate, and reduce water pollution in order to protect water quality and aquatic life in creeks, lakes, and aquifers. The program's staffs protect water quality with a wide range of pollution control strategies. They inspect and permit small businesses to prevent pollution discharges, respond to emergency spills and pollution complaints, educate citizens on ways to prevent pollution, and build water quality ponds to treat contaminated stormwater runoff. Lakes, creeks, and groundwater are also monitored to identify problem areas and to help plan effective protection. Case/Example: City of Austin (TX)'s Water Quality Protection Program. Source/Reference: City of Austin, A.

Water Quantity Protection Programs

Water supply protection programs have been used in many states to ensure the integrity of potable water supply sources for industry, agriculture and municipal users. For example, in 1992, The State of North Carolina's Environmental Management Commission adopted Water Supply Watershed Protection Rules that require all local governments having land use jurisdiction within water supply watersheds to adopt and implement water supply watershed protection ordinances, maps, and a management plans that meet state standards. The New York City water supply system provides approximately 1.3 billion gallons of high quality drinking water to almost nine million New Yorkers every day. However concerns over the availability of its continued supply and quality has led to an innovative partnership among local, state and federal authorities to protect the water supply through planning, land acquisition and regulations. Source/Reference: Department of Environmental Protection, City of New York

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APPENDIX C

Matrix C-1A Goals of Transportation-Related Strategies and Policy Actions

Strategy		Policy Action		a	b	c	d	e	f	g	h	i	j	k	l	
				Provide Transportation Choices.	Reduce Auto VMT.	Manage Congestion.	Ensure Adequate Level-of-Service.	Promote Land Use Accessibility	Manage Expansion of Urbanized Area.	Preserve Natural Resources & Open Space.	Minimize Environmental Impacts.	Promote Economic Vitality.	Promote Social Equity.	Strengthen Community Livabili	Strengthen Coor	
Transportation-Efficient Land Use Planning and Development Strategies		Rail-Based Transit-Oriented Development (TOD)	1	**P**	**S**			**P**	**S**		**S**	**S**		**S**		1
		Bus-Based Transit-Oriented Development (TOD)	2	**P**	**S**			**P**	**S**		**S**			**P**		2
		Traditional Neighborhood Development (TND)	3	**P**	**S**			**P**	**S**		**S**	**S**		**P**		3
		Main Street Program (Downtown Revitalization)	4	**S**	**S**			**S**	**S**		**S**	**P**	**S**	**P**		4
		Neighborhood Conservation Program	5				**P**		**S**		**S**	**S**	**S**	**P**		5
		Jobs-Housing Balance Programs	6		**S**	**S**	**S**	**S**	**S**		**S**		**S**			6
		Corridor Preservation and Planning	7				**S**	**S**	**S**		**S**	**S**		**P**	**P**	7
		Access Management Program	8		**S**	**P**	**S**	**P**			**S**	**S**				8
		Parking Supply Management: Flexible Requirements	10	**S**	**S**	**S**	**S**				**S**			**S**		10
		Parking Restrictions: Area-wide Parking Caps	11		**P**	**S**					**S**					11
Pricing Strategies	Automobiles / Roadways	Parking Demand Management	12		**P**	**S**					**S**					12
		Gasoline Tax Increase	13		**P**	**S**					**S**		**S**			13
		Road Pricing: Toll Roads	14		**P**	**S**	**P**				**S**					14
		Congestion Pricing: High Occupancy Toll (HOT) Lanes	15		**P**	**P**	**S**				**P**		**S**			15
		Congestion Pricing: Area-Wide or Cordon Pricing	16		**P**	**P**	**S**				**P**					16
		Congestion Pricing by Automatic Vehicle Identification (AVI)	17		**P**	**P**	**S**				**P**					17
		Distance-based Taxes	18		**P**	**S**					**S**		**S**			18
	Transit	Transit Fare Adjustment	19	**S**	**S**	**S**							**P**			19
Alternative Mode Support Strategies	Facility and Systems Improvements	Traffic Calming	20	**P**	**S**						**S**			**P**		20
		Alternative Roadway Design Standards	21	**P**			**S**	**S**		**S**				**S**		21
		High Occupancy Vehicle (HOV) Facilities	22	**P**	**P**	**S**	**P**				**S**					22
		Bus Transit Service Improvement	23	**P**	**S**		**P**	**S**			**S**		**S**			23
		Custom Transit Services	24	**P**	**S**		**P**						**P**			24
		Non-Motorized Mode Facility Support	25	**P**	**S**						**S**		**S**	**S**		25
		Park & Ride Lots	26	**P**	**S**	**S**	**S**									26
		Transportation Enhancements Program	27	**P**	**S**			**S**			**S**			**P**		27
		Carsharing and Ridematching Services	28	**P**	**P**	**S**	**S**									28
		Vanpooling and Ridematching Services	29	**P**	**P**	**S**	**S**									29
		Information Technology Applications for Transit and Ridesharing Modes	30	**P**	**S**	**S**	**S**									30
	Capital Investments	Light Rail Transit (LRT) Investments	31	**P**	**S**	**S**	**P**			**S**	**S**	**S**	**S**	**S**		31
		Bus Rapid Transit (BRT) Investments	32	**P**	**S**	**S**	**P**			**S**	**S**	**S**	**S**			32
		Commuter/Heavy Rail Transit Investments	33	**P**	**S**	**S**	**S**			**S**	**S**	**S**	**S**			33
	Public Education	Public Education and Promotion for Alternative Modes	34	**P**	**P**						**S**					34
Worksite-Based Strategies		Monetary Incentives for Alternative Mode Use	35	**P**	**P**	**S**					**S**					35
		Alternative Work Schedules	36	**S**	**S**	**P**					**S**					36
		Worksite Parking Management	37	**S**	**P**	**S**					**S**					37
		Employment-Based Proximate Commuting Program	38	**S**	**P**	**S**		**S**			**S**					38
		On-Site Facility Amenities Provision	39	**S**	**S**			**P**			**S**					39
		Transportation Management Associations	40	**S**	**P**	**P**					**S**	**S**			**P**	40
Objective-Based Strategies	Incentives	Location Efficient Mortgages (LEM)	41	**S**	**S**			**P**	**S**		**S**	**S**	**S**	**S**		41
		Live Near Your Work Program	42	**S**	**P**	**S**		**S**			**S**					42
	Service Provisions	Job Access and Reverse Commute Program	43	**P**				**P**				**S**	**P**			43
Roadway Investment Strategies		Fix-It-First Strategies for Roadways Investment	44				**P**		**P**		**S**	**S**				44
Coordinating and Integrating Processes, Plans, and Functional Assignments		Performance Measures Tied to Growth Management Goals	45				**P**		**S**						**P**	45
		Coordinated Plan Review Process	46						**S**					**P**	**P**	46
		Trip Reduction Ordinances and Programs	47	**P**	**P**	**S**					**S**		**S**		**P**	47
		Funding Allocation Systems Tied to Growth Management Goals	48	**S**			**P**		**S**			**S**		**S**	**P**	48
		Land Use Expert Panels	49						**P**						**P**	49
		Transportation and Growth Management (TGM) Joint Program/Consortium	50	**S**	**S**		**S**		**S**						**P**	50

Note:
1. P: Primary Goal, S: Secondary Goal
2. See Appendix 1 (Handy, et al., 2002) for descriptions of transportation-related policy actions.
3. The upper-right marked cells indicates potential conflicts and/or condition-sensitive results. (Panelists have different opinions or say matching bewteen actions and goals vary and depend on given environment or conditions.) Broadly speaking, this shows how much goals are all correlated and how much actions might have flexible outcomes.

Matrix C-1B Goals of Growth-Management Strategies and Policy Actions

Strategy		Policy Action		a: Provide Transportation Choices.	b: Reduce Auto VMT.	c: Manage Congestion.	d: Ensure Adequate Level-of-Service.	e: Promote Land Use Accessibility	f: Manage Expansion of Urbanized Area.	g: Preserve Natural Resources and Open Space.	h: Minimize Environmental Impacts.	i: Promote Economic Vitality.	j: Promote Social Equity.	k: Strengthen Community Livability	l: Strengthen Coor	
Urban Containment Strategies	Targeted Growth	Urban Growth Boundaries (UGB)	1		S			S	P	P	P	S		S		1
		Intermediate Growth Boundaries	2					S	P	P	P					2
		Urban Development Reserves	3						P	P	P			S		3
		Urban Service Areas/Boundaries (USA or USB)	4						P	S	S				S	4
		State Capital Investment Priorities (Priority Funding Areas)	5						S		S	P		P	S	5
		Development Policy Areas	6						P	P	P	P		P		6
		Land Use Information Systems	7						P	P	S				S	7
	Compact Development	Infill Development	8	S	S		S	S	P	S	S	S	S	S		8
		Cluster Development	9		S		S	S	S	P	S			S		9
		Brownfield Redevelopment	10					S	S	S	P	P	P	S		10
	Zoning Approaches	Mixed-Use Land Development	11	S	S	S		P	P	S	S	P		P		11
		Planned Unit Development (PUD)	12					S	S	S	P			S		12
		Overlay Zoning/Districts	13		S	S		S	S	S		S		S		13
		Minimum Density Zoning/Standards	14		S			S	P	S				S		14
		Upzoning/Downzoning	15					S	P	P						15
		Rehabilitation Zoning Codes	16					S	P							16
		Inclusionary Zoning	17					S	S				P	S		17
		Interim Zoning	18					S	P							18
		Floating Zones	19					S	P			S				19
	Property Taxation	Targeted Tax Abatement	20						S			S		S		20
		Split-Rate Property Tax	21						P	S	S	S	S	S		21
	Extrajurisdictional Controls and Agreements	Extraterritorial Jurisdiction	22				S		P	S					S	22
		Annexation and Municipal Incorporation	23						P	S					S	23
		Interjurisdictional Agreements	24						P	S					S	24
		Tax-Base Sharing	25						S	S		S	P	S	S	25
		Developments of Regional Impact (DRI)	26			P	S		S		P		P		P	26
Natural Resource Preservation	Land Preservation	Land Acquisition and Banking	27				P		S	P	S			S		27
		Transferable Development Rights (TDR)	28						S	P	S			S		28
		Purchase of Development Rights (PDR)	29						S	P	S			S		29
		Conservation Easements	30						S	P	S			S		30
		Farmland Preservation Credits	31						P	P	S	P				31
		Differential Assessment Programs	32						P	P	S	S	S			32
		Agricultural and Forest Programs	33						S	P	P	P	S			33
		Sensitive Area Zoning	34						S	P				S		34
	Water Protection	Water Quality Protection Programs	35						S	P	P			S		35
		Water Quantity Protection Programs	36											S		36
Facility Adequacy, Timing, and Planning	Facility Planning	Capital Improvement Programs (CIP)	37				P		S	S	S	S			P	37
	Facility Adequacy	Adequate Public Facility (APF) Standards/Requirements	38				P		P	P	S					38
	Facility Financing	Development Exactions	39				P		S	S	S			S		39
		Impact Fees	40				P		S	S	S			S		40
		Special Financing Districts	41				P		S	S	S		S	S		41
		Cost-based Utility and Stormwater Fees	42						S			S	P			42
	Growth Limits/Controls	Growth-Phasing Systems for Public Facilities	43				P		P	P	S			S	S	43
		Development Caps and Rate Allocation Systems	44				P		P	P	S			P		44
		Carrying Capacity Limitations	45				P		P	P	S			P		45
		Moratoriums and Interim Development Regulations	46						P	P	S		S		S	46
Coordinating and Integrating Processes, Plans, and Functional Assignments	Plans	State Development Plans	47				S		P	S	S	P		P	S	47
		Comprehensive Plans	48		S		S	S	P	S	S	P		P	S	48
		Specific-Area Development Plans	49	S		S	S	S	S	S	S	P		P	S	49
		Strategic Policy Plans	50	S	S	S	S	S	S	S	S	S	S	S	S	50
	Processes	Streamlined Permit Processing	51						S	S		S			P	51
		Vertical Plan Consistency Requirements	52				S		S	S	S		S		P	52
		Horizontal Plan Consistency Requirements	53				S		S	S	S		S		P	53
		Cross-Acceptance Process	54				S		S	S	S	S	S		P	54
		Comprehensive Plan Consistency Requirements	55				S		S	S	S		S		P	55
		State Policy Assessment	56	S	S	S	S	S	S	S	S	S	S	S	S	56
	Functional Assignments	Regional Growth Management Hearing Board	57				S		S	S	S	S	S		P	57
		Regional Planning Councils	58				P		S	S	S	S	S		P	58
		Regional Service Provider	59				P		S	S	S	S	S		P	59

Note:
1. P: Primary Goal, S: Secondary Goal
2. See Appendix 2 (Handy, et al., 2002) for descriptions of growth management policy actions.
3. The upper-right marked cells indicates potential conflicts and/or condition-sensitive results. (Panelists have different opinions or say matching bewteen actions and goals vary and depend on given environment or conditions.) Broadly speaking, this shows how much goals are all correlated and how much actions might have flexible outcomes.

Matrix C-2A Characteristics of Transportation-related Strategies and Policy Actions

Strategy		Policy Action		Policy Action Characteristics																			
				Policy Action Experience		Administrative Approach				Estimated Implementation Cost		Estimated Implementation Period		Enabling Authority Requirements		Implementing Agency							
				Well-established	Experimen-tal	Planning Approach	Market Approach	Regulatory Approach	Capital Investment	Medium	High	Short (<1 Yr)	Long (>= 1 Yr)	Low	High	State Gov't	MPO	Transit Agency	County Gov't	City Gov't	Private / Nonprofit		
				a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r		
Transportation-Efficient Land Use Planning and Development Strategies		Rail-Based Transit-Oriented Development (TOD)	1	■		■	■	■	■	■	■		■								■	1
		Bus-Based Transit-Oriented Development (TOD)	2	■		■	■	■	■	■	■		■					■		■	■	2
		Traditional Neighborhood Development (TND)	3		■	■	■	■		■			■							■	■	3
		Main Street Program (Downtown Revitalization)	4	■		■					■		■							■		4
		Neighborhood Conservation Program	5	■	■	■					■		■			■				■		5
		Jobs-Housing Balance Programs	6		■		■	■		■			■			■	■			■		6
		Corridor Preservation and Planning	7		■	■			■		■		■							■		7
		Access Management Program	8		■	■		■		■		■	■			■	■		■	■		8
		Parking Supply Management: Allowing Flexible Requirements	10		■		■	■		■		■								■		10
		Parking Supply Management: Area-wide Parking Caps	11		■			■		■			■							■		11
Pricing Strategies	Automobiles / Roadways	Extended Parking Charges	12	■			■			■		■								■	■	12
		Gasoline Tax Increase	13	■			■			■		■				■						13
		Road Pricing: Toll Roads	14	■			■		■	■	■		■			■	■					14
		Congestion Pricing: High Occupancy Toll (HOT) Lanes	15		■		■		■		■		■			■	■					15
		Congestion Pricing: Area-Wide or Cordon Pricing	16		■		■				■		■			■	■			■		16
		Congestion Pricing by Automatic Vehicle Identification (AVI)	17		■		■				■		■			■	■					17
		Distance-based Taxes	18		■		■			■			■			■						18
	Transit	Transit Fare Adjustment	19	■			■			■		■				■		■				19
Alternative Mode Support Strategies	Facility and Systems Improvements	Traffic Calming	20		■				■	■	■	■	■									20
		Alternative Roadway Design Standards	21		■				■	■	■	■	■									21
		High Occupancy Vehicle (HOV) Facilities	22	■					■	■	■	■	■			■	■					22
		Bus Transit Service Improvement	23	■		■			■	■	■	■	■					■		■		23
		Custom Transit Services	24		■	■			■		■	■	■							■		24
		Non-Motorized Mode Facility Support	25	■		■			■	■		■	■				■	■	■	■		25
		Park & Ride Lots	26	■					■	■	■	■	■				■	■	■	■		26
		Transportation Enhancements Program	27	■					■		■	■	■				■		■	■		27
		Carsharing and Ridematching Services	28	■		■				■		■					■		■	■	■	28
		Vanpooling and Ridematching Services	29	■		■				■		■					■	■	■	■	■	29
		Information Technology Applications for Transit and Ridesharing Modes	30	■		■	■			■		■					■	■				30
	Capital Investments	Light Rail Transit (LRT) Investments	31	■		■			■		■		■				■	■	■	■		31
		Bus Rapid Transit (BRT) Investments	32		■	■			■		■		■				■	■	■	■		32
		Commuter/Heavy Rail Transit Investments	33	■		■			■		■		■			■	■	■	■	■		33
	Public Education	Public Education and Promotion for Alternative Modes	34	■		■				■		■				■	■	■	■	■	■	34
Worksite-Based Strategies		Monetary Incentives for Alternative Mode Use	35		■		■			■		■				■	■			■	■	35
		Alternative Work Schedules	36	■		■				■		■				■	■			■	■	36
		Worksite Parking Management	37		■	■	■			■		■				■	■				■	37
		Employment-Based Proximate Commuting Program	38		■	■				■		■				■	■				■	38
		On-Site Facility Amenities Provision	39	■		■		■		■		■	■			■	■				■	39
		Transportation Management Associations	40	■		■		■		■		■				■	■				■	40
Objective-Based Strategies	Incentives	Location Efficient Mortgages (LEM)	41		■		■			■			■				■	■			■	41
		Live Near Your Work Program	42		■	■				■			■			■	■				■	42
	Service Provisions	Job Access and Reverse Commute Program	43		■	■					■	■				■	■	■			■	43
Roadway Investment Strategies		Fix-It-First Strategies for Roadways Investment	44		■	■			■	■		■				■	■					44
Coordinating and Integrating Processes, Plans, and Functional Assignments		Performance Measures Tied to Growth Management Goals	45		■	■				■		■				■	■	■	■	■		45
		Coordinated Plan Review Process	46		■	■		■		■		■				■	■	■	■	■		46
		Trip Reduction Ordinances and Programs	47	■				■		■		■				■			■	■	■	47
		Funding Allocation Systems Tied to Growth Management Goals	48		■	■				■		■				■	■		■	■		48
		Land Use Expert Panels	49		■	■				■		■					■		■	■		49
		Transportation and Growth Management (TGM) Joint Program/Consortium	50		■	■				■		■				■	■	■	■	■		50

Note:

1. See Appendix 1 (Handy, et al., 2002) for descriptions of transportation-related policy actions.
2. The upper-right marked cells indicates potential conflicts and/or condition-sensitive results. (Panelists have different opinions or say matching bewteen actions and characteristics vary and depend on given environment or conditions.) Broadly speaking, this shows how much actions might have flexible outcomes.

Matrix C-2A Characteristics of Growth-Management Stategies and Actions

Strategy		Policy Action		Policy Action Characteristics																			
				Policy Action Experience		Administrative Approach				Estimated Implementation Cost		Estimated Implementation Period		Enabling Authority Requirements		Implementing Agency							
				Well-established	Experimental	Planning Approach	Market Approach	Regulatory Approach	Capital Investment	Medium	High	Short (<1 Yr)	Long (>= 1 Yr)	Low	High	State Gov't	MPO	Transit Agency	County Gov't	City Gov't	Private / Nonprofit		
				a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r		
Urban Containment Strategies	Targeted Growth	Urban Growth Boundaries (UGB)	1	■		■		■	■	■			■				■		■	■		1	
		Intermediate Growth Boundaries	2	■		■	■	■	■	■			■						■	■		2	
		Urban Development Reserves	3	■		■		■	■	■			■						■	■		3	
		Urban Service Areas/Boundaries (USA or USB)	4	■		■			■	■			■						■	■		4	
		State Capital Investment Priorities (Priority Funding Areas)	5		■	■	■			■			■						■	■		5	
		Development Policy Areas	6	■		■				■			■			■	■		■	■		6	
		Land Use Information Systems	7	■		■				■			■			■	■		■	■		7	
	Compact Development	Infill Development	8	■		■	■	■		■			■						■	■		8	
		Cluster Development	9	■		■		■		■			■						■	■		9	
		Brownfield Redevelopment	10	■		■	■	■	■	■			■			■			■	■		10	
	Zoning Approaches	Mixed-Use Land Development	11	■		■	■	■		■		■								■		11	
		Planned Unit Development (PUD)	12	■		■		■		■		■								■		12	
		Overlay Zoning/Districts	13	■		■		■		■		■								■		13	
		Minimum Density Zoning/Standards	14		■	■		■		■		■								■		14	
		Upzoning/Downzoning	15	■		■		■		■		■								■		15	
		Rehabilitation Zoning Codes	16		■			■		■			■						■	■		16	
		Inclusionary Zoning	17		■			■		■			■						■	■		17	
		Interim Zoning	18		■			■		■		■							■	■		18	
		Floating Zones	19	■		■		■		■		■								■		19	
	Property Taxation	Targeted Tax Abatement	20	■		■	■	■	■	■		■	■			■				■		20	
		Split-Rate Property Tax	21		■	■	■			■		■	■			■				■		21	
	Extrajurisdictional Controls and Agreements	Extraterritorial Jurisdiction	22	■		■		■	■	■			■				■		■	■		22	
		Annexation and Municipal Incorporation	23	■		■		■		■			■				■		■	■		23	
		Interjurisdictional Agreements	24	■		■		■		■			■				■		■	■		24	
		Tax-Base Sharing	25		■	■	■			■			■				■		■	■		25	
		Developments of Regional Impact (DRI)	26	■		■		■		■			■				■		■	■		26	
Natural Resource Preservation	Land Preservation	Land Acquisition and Banking	27	■		■	■				■	■	■				■			■		27	
		Transferable Development Rights (TDR)	28	■		■	■	■		■		■					■			■	■	28	
		Purchase of Development Rights (PDR)	29	■		■	■			■		■					■		■	■	■	29	
		Conservation Easements	30	■		■	■			■		■					■			■		30	
		Farmland Preservation Credits	31	■			■			■		■							■	■		31	
		Differential Assessment Programs	32	■			■			■		■							■	■		32	
		Agricultural and Forest Programs	33	■		■	■	■	■	■		■	■			■				■		33	
		Sensitive Area Zoning	34		■			■		■			■						■	■		34	
	Water Protection	Water Quality Protection Programs	35	■		■		■		■		■				■				■		35	
		Water Quantity Protection Programs	36																			36	
Facility Adequacy, Timing, and Planning	Facility Planning	Capital Improvement Programs (CIP)	37	■		■				■			■			■				■		37	
	Facility Adequacy	Adequate Public Facility (APF) Standards/Requirements	38	■				■		■	■		■			■				■		38	
	Facility Financing	Development Exactions	39	■		■	■		■	■			■							■		39	
		Impact Fees	40	■		■	■		■	■			■							■		40	
		Special Financing Districts	41	■		■	■		■	■			■							■	■	41	
		Cost-based Utility and Stormwater Fees	42		■		■			■		■				■	■		■	■		42	
	Growth Limits/Controls	Growth-Phasing Systems for Public Facilities	43		■	■			■	■			■							■		43	
		Development Caps and Rate Allocation Systems	44	■		■		■		■			■							■		44	
		Carrying Capacity Limitations	45		■	■		■		■			■							■		45	
		Moratoriums and Interim Development Regulations	46	■		■		■		■		■								■		46	
Coordinating and Integrating Processes, Plans, and Functional Assignments	Plans	State Development Plans	47	■		■		■		■			■			■						47	
		Comprehensive Plans	48	■		■		■		■			■			■	■		■	■		48	
		Specific-Area Development Plans	49	■		■		■		■			■			■						49	
		Strategic Policy Plans	50	■		■		■		■			■			■	■		■	■		50	
	Processes	Streamlined Permit Processing	51	■		■		■		■			■			■	■		■	■		51	
		Vertical Plan Consistency Requirements	52	■				■		■			■			■	■		■	■		52	
		Horizontal Plan Consistency Requirements	53	■		■		■		■			■			■	■		■	■		53	
		Cross-Acceptance Process	54		■	■		■		■			■			■	■		■	■		54	
		Comprehensive Plan Consistency Requirements	55	■		■		■		■			■			■	■		■	■		55	
		State Policy Assessment	56		■	■				■			■			■						56	
	Functional Assignments	Regional Growth Management Hearing Board	57		■			■		■		■					■					57	
		Regional Planning Councils	58	■		■		■		■			■				■					58	
		Regional Service Provider	59		■	■	■	■	■	■		■					■					59	

Note:
1. See Appendix 2 (Handy, et al., 2002) for descriptions of growth-management policy actions.
2. The upper-right marked cells indicates potential conflicts and/or condition-sensitive results. (Panelists have different opinions or say matching bewteen actions and characteristics vary and depend on given environment or conditions.)
Broadly speaking, this shows how much actions might have flexible outcomes.

Matrix C-3A Suitability Factors of Transportation-Related Strategies and Policy Actions:

Strategy		Policy Action		Suitability Factor																
				Size of Jurisdiction				Rate of Growth		Congestion		Transportation Disadvantaged Population		Planning & Land Use Authority			Planning Culture			
				Small (<20K)	Medium (20K-200K)	Large (200K-1M)	Very Large (>1M)	Slow	Fast	Low	High	Low	High	Low (Counties)	Medium (General Law Cities)	High (Home Rule Cities)	Limited Planning & Land Use Control	Pro-planning & Land Use Control		
				a	b	c	d	e	f	g	h	i	j	k	l	m	n	o		
Transportation-Efficient Land Use Planning and Development Strategies		Rail-Based Transit-Oriented Development (TOD)	1																1	
		Bus-Based Transit-Oriented Development (TOD)	2																2	
		Traditional Neighborhood Development (TND)	3																3	
		Main Street Program (Downtown Revitalization)	4																4	
		Neighborhood Conservation Program	5																5	
		Jobs-Housing Balance Programs	6																6	
		Corridor Preservation and Planning	7																7	
		Access Management Program	8																8	
		Parking Supply Management: Allowing Flexible Requirements	10																10	
		Parking Supply Management: Area-wide Parking Caps	11																11	
Pricing Strategies	Automobiles / Roadways	Extended Parking Charges	12																12	
		Gasoline Tax Increase	13																13	
		Road Pricing: Toll Roads	14																14	
		Congestion Pricing: High Occupancy Toll (HOT) Lanes	15																15	
		Congestion Pricing: Area-Wide or Cordon Pricing	16																16	
		Congestion Pricing by Automatic Vehicle Identification (AVI)	17																17	
		Distance-based Taxes	18																18	
	Transit	Transit Fare Adjustment	19																19	
Alternative Mode Support Strategies	Facility and Systems Improvements	Traffic Calming	20																20	
		Alternative Roadway Design Syandards	21																21	
		High Occupancy Vehicle (HOV) Facilities	22																22	
		Bus Transit Service Improvement	23																23	
		Custom Transit Services	24																24	
		Non-Motorized Mode Facility Support	25																25	
		Park & Ride Lots	26																26	
		Transportation Enhancements Program	27																27	
		Carsharing and Ridematching Services	28																28	
		Vanpooling and Ridematching Services	29																29	
		Information Technology Applications for Transit and Ridesharing Modes	30																30	
	Capital Investments	Light Rail Transit (LRT) Investments	31																31	
		Bus Rapid Transit (BRT) Investments	32																32	
		Commuter/Heavy Rail Transit Investments	33																33	
	Public Education	Public Education and Promotion for Alternative Modes	34																34	
Worksite-Based Strategies		Monetary Incentives for Alternative Mode Use	35																35	
		Alternative Work Schedules	36																36	
		Worksite Parking Management	37																37	
		Employment-Based Proximate Commuting Program	38																38	
		On-Site Facility Amenities Provision	39																39	
		Transportation Management Associations	40																40	
Objective-Based Strategies	Incentives	Location Efficient Mortgages (LEM)	41																41	
		Live Near Your Work Program	42																42	
	Service Provisions	Job Access and Reverse Commute Program	43																43	
Roadway Investment Strategies		Fix-It-First Strategies for Roadways Investment	44																44	
Coordinating and Integrating Processes, Plans, and Functional Assignments		Performance Measures Tied to Growth Management Goals	45																45	
		Coordinated Plan Review Process	46																46	
		Trip Reduction Ordinances and Programs	47																47	
		Funding Allocation Systems Tied to Growth Management Goals	48																48	
		Land Use Expert Panels	49																49	
		Transportation and Growth Management (TGM) Joint Program/Consortium	50																50	

Note:

1. See Appendix 1 (Handy, et al., 2002) for descriptions of transportation-related policy actions.
2. The upper-right marked cells indicates potential conflicts and/or condition-sensitive results. (Panelists have different opinions or say matching bewteen actions and suitability factors vary and depend on given environment or conditions.) Broadly speaking, this shows how much actions might have flexible outcomes.

Matrix C-3A Suitability Factors of Growth-Management Strategies and Policy Actions

Strategy		Policy Action		Suitability Factor																
				Size of Jurisdiction				Rate of Growth		Congestion		Transportation Disadvantaged Population		Planning & Land Use Authority			Planning Culture			
				Small (<20K)	Medium (20K-200K)	Large (200K-1M)	Very Large (>1M)	Slow	Fast	Low	High	Low	High	Low (Counties)	Medium (General Law Cities)	High (Home Rule Cities)	Limited Planning & Land Use Control	Pro-planning & Land Use Control		
				a	b	c	d	e	f	g	h	i	j	k	l	m	n	o		
Urban Containment Strategies	Targeted Growth	Urban Growth Boundaries (UGB)	1																1	
		Intermediate Growth Boundaries	2																2	
		Urban Development Reserves	3																3	
		Urban Service Areas/Boundaries (USA or USB)	4																4	
		State Capital Investment Priorities (Priority Funding Areas)	5																5	
		Development Policy Areas	6																6	
		Land Use Information Systems	7																7	
	Compact Development	Infill Development	8																8	
		Cluster Development	9																9	
		Brownfield Redevelopment	10																10	
	Zoning Approaches	Mixed-Use Land Development	11																11	
		Planned Unit Development (PUD)	12																12	
		Overlay Zoning/Districts	13																13	
		Minimum Density Zoning/Standards	14																14	
		Upzoning/Downzoning	15																15	
		Rehabilitation Zoning Codes	16																16	
		Inclusionary Zoning	17																17	
		Interim Zoning	18																18	
		Floating Zones	19																19	
	Property Taxation	Targeted Tax Abatement	20																20	
		Split-Rate Property Tax	21																21	
	Extrajurisdictional Controls and Agreements	Extraterritorial Jurisdiction	22																22	
		Annexation and Municipal Incorporation	23																23	
		Interjurisdictional Agreements	24																24	
		Tax-Base Sharing	25																25	
		Developments of Regional Impact (DRI)	26																26	
Natural Resource Preservation	Land Preservation	Land Acquisition and Banking	27																27	
		Transferable Development Rights (TDR)	28																28	
		Purchase of Development Rights (PDR)	29																29	
		Conservation Easements	30																30	
		Farmland Preservation Credits	31																31	
		Differential Assessment Programs	32																32	
		Agricultural and Forest Programs	33																33	
		Sensitive Area Zoning	34																34	
	Water Protection	Water Quality Protection Programs	35																35	
		Water Quantity Protection Programs	36																36	
Facility Adequacy, Timing, and Planning	Facility Planning	Capital Improvement Programs (CIP)	37																37	
	Facility Adequacy	Adequate Public Facility (APF) Standards/Requirements	38																38	
	Facility Financing	Development Exactions	39																39	
		Impact Fees	40																40	
		Special Financing Districts	41																41	
		Cost-based Utility and Stormwater Fees	42																42	
	Growth Limits/Controls	Growth-Phasing Systems for Public Facilities	43																43	
		Development Caps and Rate Allocation Systems	44																44	
		Carrying Capacity Limitations	45																45	
		Moratoriums and Interim Development Regulations	46																46	
Coordinating and Integrating Processes, Plans, and Functional Assignments	Plans	State Development Plans	47																47	
		Comprehensive Plans	48																48	
		Specific-Area Development Plans	49																49	
		Strategic Policy Plans	50																50	
	Processes	Streamlined Permit Processing	51																51	
		Vertical Plan Consistency Requirements	52																52	
		Horizontal Plan Consistency Requirements	53																53	
		Cross-Acceptance Process	54																54	
		Comprehensive Plan Consistency Requirements	55																55	
		State Policy Assessment	56																56	
	Functional Assignments	Regional Growth Management Hearing Board	57																57	
		Regional Planning Councils	58																58	
		Regional Service Provider	59																59	

Note:
1. See Appendix 2 (Handy, et al., 2002) for descriptions of growth-management policy actions.
2. The upper-right marked cells indicates potential conflicts and/or condition-sensitive results. (Panelists have different opinions or say matching bewteen actions and suitability factors vary and depend on given environment or conditions.) Broadly speaking, this shows how much actions might have flexible outcomes.

MATRIX C-4A Effectiveness Matrix (Expert/Lit. Review)

Goals of Transportation-related Strategies and Policy Actions

Strategy		Policy Action/Tool (lit review score (Mean)(Ratio))**	a. Provide Transportation Choices.	b. Reduce Auto VMT.	c. Manage Congestion.	d. Ensure Adequate Level-of-Service.	e. Promote Land Use Accessibility	f. Manage Expansion of Urbanized Area.	g. Preserve Natural Resources & Open Space.	h. Minimize Environmental Impacts.	i. Promote Economic Vitality.	j. Promote Social Equity.	k. Strengthen Community Livability.	l. Strengthen Coordination.
Transportation-Efficient Land Use Planning and Development Strategies		Rail-Based Transit-Oriented Development (TOD) **(1.36/2) (+4.75:1)**	**2.57/**	**2.29/**			**2.5/**	**2.17/**		**2.0/**	**2.17/**		**2.5/**	
		Bus-Based Transit-Oriented Development (TOD)	**2.57/**	**2.14/**			**2.17/**	**2.0/**		**2.0/**			**2.17/**	
		Traditional Neighborhood Development (TND)**(2.22/1)(+9:1)**	**2.42/**	**1.71/**			**2.33/**	**1.67/**		**2.0/**	**2.0/**		**2.67/**	
		Main Street Program (Downtown Revitalization)**(1.75/*)(+4:0)**	**2/**	**1.57/**			**2.0/**	**1.67/**		**1.71/**	**2.83/**	**2.0/**	**2.67/**	
		Neighborhood Conservation Program **(1.67/*)(+3:0)**				**1.33/**		**1.5/**		**1.86/**	**2.0/**	**2.17/**	**2.67/**	
		Jobs-Housing Balance Programs		**2.29/**	**1.86/**	**1.57/**	**2.33/**	**1.67/**		**1.57/**		**2.5/**		
		Corridor Preservation and Planning**(1/1)(+2:1)**				**2.29/**	**2.14/**	**1.86/**		**1.67/**	**2.0/**		**1.86/**	**2.43/**
		Access Management Program**(1.63/*)(+8:0)**		**1.67/**	**1.86/**	**2.14/**	**1.67/**			**1.5/**	**1.0/**			
		Parking Supply Management: Flexible Requirements**(1.25/*)(+4:0)**	**1.71/**	**2.0/**	**1.86/**	**1.86/**				**2.14/**			**1.71/**	
		Parking Restrictions: Area-wide Parking Caps**(2.67/*)(+3:1)**		**2.43/**	**2.29/**					**2.14/**				
Pricing Strategies	Automobiles / Roadways	Parking Demand Management**(1.7/2)(+10:1)**		**2.43/**	**2.14/**					**2.17/**				
		Gasoline Tax Increase**(.5/.5)(1:1)**		**2.57/**	**2.43/**					**2.43/**		**1.43/**		
		Road Pricing: Toll Roads**(1.1/*)(+11:0)**		**2.29/**	**2.57/**	**2.43/**				**1.86/**				
		Congestion Pricing: High Occupancy Toll (HOT) Lanes**(1.1/1)(+16:1)**		**2.57/**	**2.43/**	**2.43/**				**2.17/**		**1.5/**		
		Congestion Pricing: Area-Wide or Cordon Pricing **(3/*)(+1.3:1)**		**2.86/**	**2.71/**	**2.29/**				**2.17/**				
		Congestion Pricing by Automatic Vehicle Identification (AVI)		**2.43/**	**2.57/**	**2.43/**				**2.17/**				
		Distance-based Taxes**(1/*)(+4:0)**		**2.14/**	**1.57/**					**1.86/**		**1.67/**		
	Transit	Transit Fare Adjustment**(1.86/1)(+3.5:1)**	**2.14/**	**1.71/**	**1.57/**							**2.33/**		
Alternative Mode Support Strategies	Facility and Systems Improvements	Traffic Calming**(1.8/*)(+11:0)**	**1.71/**	**1.14/**						**1.5/**			**2.67/**	
		Alternative Roadway Design Standards**(1/*)(+3:0)**	**2.0/**			**1.29/**	**1.67/**		**1.83/**	**2.17/**			**2.5/**	
		High Occupancy Vehicle (HOV) Facilities**(1.5/1)(+2.66:1)**	**2.14/**	**2.0/**	**1.86/**	**1.86/**				**1.33/**				
		Bus Transit Service Improvement**(1.71/3)(+7:1)**	**2.57/**	**1.86/**		**1.83/**	**1.5/**			**1.5/**		**2.5/**		
		Custom Transit Services**(2/*)(+3:0)**	**2.71/**	**1.71/**		**1.5/**						**2.5/**		
		Non-Motorized Mode Facility Support**(1.27/*)(+11:0)**	**2.71/**	**1.71/**						**2.0/**		**2.17/**	**2.67/**	
		Park & Ride Lots**(1.55/1)(+9:1)**	**1.71/**	**1.71/**	**1.71/**	**1.5/**								
		Transportation Enhancements Program **(1.6/*)(+5:0)**	**2.42/**	**2.0/**			**1.67/**			**1.83/**			**2.17/**	
		Carsharing and Ridematching Services**(1.1/1.5)(+6:1)**	**2.42/**	**1.71/**	**1.71/**	**1.33/**								
		Vanpooling and Ridematching Services	**2.42/**	**1.57/**	**1.71/**	**1.33/**								
		I.T. Applications for Transit and Ridesharing Modes**(2/*)(+1:0)**	**2.14/**	**1.57/**	**1.71/**	**1.67/**								
	Capital Investments**(1.44/1.5)(+4:1)**	Light Rail Transit (LRT) Investments **(2/1.67)(-3:1)**	**2.71/**	**2.0/**	**2.0/**	**1.86/**			**1.29/**	**1.71/**	**1.86/**	**1.86/**	**2.29/**	
		Bus Rapid Transit (BRT) Investments	**2.71/**	**2.0/**	**2.0/**	**2.0/**			**1.14/**	**1.71/**	**1.86/**	**2.29/**		
		Commuter/Heavy Rail Transit Investments	**2.5/**	**2.0/**	**2.17/**	**2.17/**			**1.17/**	**1.8/**	**2.0/**	**1.5/**		
	Public Education	Public Education and Promotion for Alternative Modes**(1/*)(+1:0)**	**1.71/**	**1.57/**						**1.57/**				
Worksite-Based Strategies(1.83/*)(+6:0)		Monetary Incentives for Alternative Mode Use**(1/1.5)(-1:0)**	**2.14/**	**2.14/**	**2.14/**					**2.0/**				
		Alternative Work Schedules**(1.33/*)(+3:0)**	**1.43/**	**1.29/**	**2.43/**					**1.43/**				
		Worksite Parking Management **(2/2)(+5:1)**	**1.29/**	**2.0/**	**2.0/**					**1.71/**				
		Employment-Based Proximate Commuting Program	**1.71/**	**1.86/**	**1.71/**		**1.5/**			**1.43/**				
		On-Site Facility Amenities Provision	**1.66/**	**1.5/**			**1.5/**			**1.5/**				
		Transportation Management Associations	**1.86/**	**1.57/**	**1.71/**					**1.43/**	**1.57/**			**2.14/**
Objective-Based Strategies**(1/*)(+1:0)**	Incentives	Location Efficient Mortgages (LEM)**(1.33/*)(+3:0)**	**1.86/**	**1.67/**			**2.29/**	**1.86/**		**1.57/**	**2.0/**	**2.43/**	**2.14/**	
		Live Near Your Work Program **(2.5/*)(+2:0)**	**1.71/**	**1.67/**	**1.67/**		**2.0/**			**1.5/**				
	Service Provisions	Job Access and Reverse Commute Program**(1/*)(+2:0)**	**2.33/**				**1.17/**				**1.67/**	**2.67/**		
Roadway Investment Strategies		Fix-It-First Strategies for Roadways Investment				**1.43/**		**1.67/**		**1.8/**	**1.8/**			
Coordinating and Integrating Processes, Plans, and Functional Assignments**(1.17/*)(+6:0)**		Performance Measures Tied to Growth Management Goals				**2.0/**		**2.0/**						**1.86/**
		Coordinated Plan Review Process						**2.2/**					**1.8/**	**2.43/**
		Trip Reduction Ordinances and Programs**(*/2)(-1:0)**	**1.83/**	**1.71/**	**1.86/**					**1.86/**		**1.5/**		**1.86/**
		Funding Allocation Systems Tied to Growth Management Goals	**2.2/**			**2.33/**		**2.33/**			**1.86/**		**2.17/**	**2.43/**
		Land Use Expert Panels						**1.5/**						**2.14/**
		TGM Joint Program/Consortium**(1/*)(+1:0)**	**2.0/**	**2.2/**		**1.8/**		**2.0/**						**2.5/**

Instructions:

Do not fill the grey cells

Effectiveness Coding(grade)

V(3) - Very effective tool or policy action in achieving the corresponding goal (look at the field or column)
S(2) - Somewhat effective tool or policy action in achieving the corresponding goal
N(1) - Not effective at all in achieving the corresponding goal
N/A(missing value) - Not applicable or no knowledge of its use

**In lit review grade, grade form: (A/B) (+C: 1) is used, A: mean value for positive findings, B: mean value for negative findings, (+C:1) means ratio between positive findings and negative findings in numbers, Plus (+) refers to more positive findings a

For this, we used following weight from Evidence

- M (multivariate analysis = 3
- C (case study) = 2
- T(theory)/S(simulation) = 1
- A(anecdotal) = .5

MATRIX C-4A_1 Effectiveness Matrix (Expert*)

Goals of Transportation-related Strategies and Policy Actions

Strategy		Policy Action/Tool (lit review score (Mean)(Ratio))**	a: Provide Transportation Choices.	b: Reduce Auto VMT.	c: Manage Congestion.	d: Ensure Adequate Level-of-Service.	e: Promote Land Use Accessibility	f: Manage Expansion of Urbanized Area.	g: Preserve Natural Resources & Open Space.	h: Minimize Environmental Impacts.	i: Promote Economic Vitality.	j: Promote Social Equity.	k: Strengthen Community Livability.	l: Strengthen Coordination.
Transportation-Efficient Land Use Planning and Development Strategies		Rail-Based Transit-Oriented Development (TOD) **(1.36/2) (+4.75:1)**	**High**	**High**			**High**	**Medium**		**Medium**	**High**		**High**	
		Bus-Based Transit-Oriented Development (TOD)	**High**	**Medium**			**High**	**Low**		**Medium**			**High**	
		Traditional Neighborhood Development (TND)**(2.22/1)(+9:1)**	**High**	**Low**			**High**	**Low**		**Medium**	**Medium**		**High**	
		Main Street Program (Downtown Revitalization)**(1.75/*)(+4:0)**	**Medium**	**Low**			**Medium**	**Low**		**Low**	**High**	**Medium**	**High**	
		Neighborhood Conservation Program **(1.67/*)(+3:0)**				**Low**		**Low**		**Medium**	**Medium**	**High**	**High**	
		Jobs-Housing Balance Programs		**High**	**Medium**	**Medium**	**High**	**Low**		**Low**		**Medium**		
		Corridor Preservation and Planning**(1/1)(+2:1)**				**Medium**	**Medium**	**Medium**		**Low**	**Medium**		**Medium**	**High**
		Access Management Program**(1.63/*)(+8:0)**		**Low**	**Medium**	**Low**	**Low**			**Low**	**Low**			
		Parking Supply Management: Flexible Requirements**(1.25/*)(+4:0)**	**Low**	**Medium**	**Medium**	**Low**				**Medium**			**Low**	
		Parking Restrictions: Area-wide Parking Caps**(2.67/*)(+3:1)**		**High**	**High**					**Medium**				
Pricing Strategies	Automobiles / Roadways	Parking Demand Management**(1.7/2)(+10:1)**		**High**	**Medium**					**High**				
		Gasoline Tax Increase**(.5/.5)(1:1)**		**High**	**High**					**High**		**Low**		
		Road Pricing: Toll Roads**(1.1/*)(+11:0)**		**High**	**High**	**Low**				**Medium**				
		Congestion Pricing: High Occupancy Toll (HOT) Lanes**(1.1/1)(+16:1)**		**High**	**High**	**Low**				**High**		**Low**		
		Congestion Pricing: Area-Wide or Cordon Pricing **(3/*)(+1.3:1)**		**High**	**High**	**Low**				**High**				
		Congestion Pricing by Automatic Vehicle Identification (AVI)		**High**	**High**	**Medium**				**High**				
		Distance-based Taxes**(1/*)(+4:0)**		**Medium**	**Low**					**Medium**		**Low**		
	Transit	Transit Fare Adjustment**(1.86/1)(+3.5:1)**	**Medium**	**Low**	**Low**							**High**		
Alternative Mode Support Strategies	Facility and Systems Improvements	Traffic Calming**(1.8/*)(+11:0)**	**Low**	**Low**						**Low**			**High**	
		Alternative Roadway Design Standards**(1/*)(+3:0)**	**Medium**			**Medium**	**Low**		**Medium**	**High**			**High**	
		High Occupancy Vehicle (HOV) Facilities**(1.5/1)(+2.66:1)**	**Medium**	**Medium**	**Medium**	**High**				**Low**				
		Bus Transit Service Improvement**(1.71/3)(+7:1)**	**High**	**Medium**		**Low**	**Low**			**Low**		**High**		
		Custom Transit Services**(2/*)(+3:0)**	**High**	**Low**		**Medium**						**High**		
		Non-Motorized Mode Facility Support**(1.27/*)(+11:0)**	**High**	**Low**						**Medium**		**High**	**High**	
		Park & Ride Lots**(1.55/1)(+9:1)**	**Low**	**Low**	**Low**	**High**								
		Transportation Enhancements Program **(1.6/*)(+5:0)**	**High**	**Medium**			**Low**			**Medium**			**High**	
		Carsharing and Ridematching Services**(1.1/1.5)(+6:1)**	**High**	**Low**	**Low**	**Medium**								
		Vanpooling and Ridematching Services	**High**	**Low**	**Low**	**High**								
		I.T. Applications for Transit and Ridesharing Modes**(2/*)(+1:0)**	**Medium**	**Low**	**Low**	**High**								
	Capital Investments**(1.44/1.5)(+4:1)**	Light Rail Transit (LRT) Investments **(2/1.67)(-3:1)**	**High**	**Medium**	**Medium**	**High**			**Low**	**Low**	**Medium**	**Medium**	**High**	
		Bus Rapid Transit (BRT) Investments	**High**	**Medium**	**Medium**	**Medium**			**Low**	**Low**	**Medium**	**High**		
		Commuter/Heavy Rail Transit Investments	**High**	**Medium**		**High**			**Low**	**Medium**	**Medium**	**Low**		
	Public Education	Public Education and Promotion for Alternative Modes**(1/*)(+1:0)**	**Low**	**Low**	**High**					**Low**				
Worksite-Based Strategies(1.83/*)(+6:0)		Monetary Incentives for Alternative Mode Use**(1/1.5)(-1:0)**	**Medium**	**Medium**	**Medium**					**Medium**				
		Alternative Work Schedules**(1.33/*)(+3:0)**	**Low**	**Low**	**High**					**Low**				
		Worksite Parking Management **(2/2)(+5:1)**	**Low**	**Medium**	**Medium**					**Low**				
		Employment-Based Proximate Commuting Program	**Low**	**Medium**	**Low**		**Low**			**Low**				
		On-Site Facility Amenities Provision	**Low**	**Low**			**Low**			**Low**				
		Transportation Management Associations	**Medium**	**Low**	**Low**					**Low**	**Low**			**Medium**
Objective-Based Strategies**(1/*)(+1:0)**	Incentives	Location Efficient Mortgages (LEM)**(1.33/*)(+3:0)**	**Medium**	**Low**			**High**	**Medium**		**Low**	**Medium**	**High**	**Medium**	
		Live Near Your Work Program **(2.5/*)(+2:0)**	**Low**	**Low**	**Low**		**Medium**			**Low**				
	Service Provisions	Job Access and Reverse Commute Program**(1/*)(+2:0)**	**High**				**Low**				**Low**	**High**		
Roadway Investment Strategies		Fix-It-First Strategies for Roadways Investment				**Medium**		**Low**		**Low**	**Medium**			
Coordinating and Integrating Processes, Plans, and Functional Assignments**(1.17/*)(+6:0)**		Performance Measures Tied to Growth Management Goals				**Low**		**Medium**						**Medium**
		Coordinated Plan Review Process						**Medium**					**Low**	**High**
		Trip Reduction Ordinances and Programs**(*/2)(-1:0)**	**Medium**	**Low**	**Medium**					**Medium**		**Low**		**Medium**
		Funding Allocation Systems Tied to Growth Management Goals	**High**			**Low**		**High**			**Medium**		**High**	**High**
		Land Use Expert Panels						**Low**						**Medium**
		TGM Joint Program/Consortium**(1/*)(+1:0)**	**Medium**	**High**		**Low**		**Medium**						**High**

Instructions:
Do not fill the grey cells
Effectiveness Coding(grade)
V(3) - Very effective tool or policy action in achieving the corresponding goal (look at the field or column)
S(2) - Somewhat effective tool or policy action in achieving the corresponding goal
N(1) - Not effective at all in achieving the corresponding goal
N/A(missing value) - Not applicable or no knowledge of its use

* The expert grade is converted to a qualitative version based on HIGH, MEDIUM and LOW, using the 33% and 66% percentile cut points
**In lit review grade, grade form: (A/B) (+C: 1) is used, A: mean value for positive findings, B: mean value for negative findings, (+C:1) means ratio between positive findings and negative findings in numbers, Plus (+) refers to more positive findings a

For this, we used following weight from Evidence

- M (multivariate analysis = 3
- C (case study) = 2
- T(theory)/S(simulation) = 1
- A(anecdotal) = .5

MATRIX C-4B Effectiveness Matrix (Expert/Lit. Review)

Goals of Growth Management-related Strategies and Policy Actions

Strategy		Policy Action/Tool(lit review score (Mean)(Ratio))**	a: Provide Transportation Choices.	b: Reduce Auto VMT.	c: Manage Congestion.	d: Ensure Adequate Level-of-Service.	e: Promote Land Use Accessibility	f: Manage Expansion of Urbanized Area	g: Preserve Natural Resources and Open Space.	h: Minimize Environmental Impacts.	i: Promote Economic Vitality.	j: Promote Social Equity.	k: Strengthen Community Livability.	l: Strengthen Coordination.
Urban Containment Strategies(2.2/*)(+5:0)	Targeted Growth	Urban Growth Boundaries (UGB)(2.1/1.5)(+4.5:1)		2.43/			2.14/	2.86/	2.71/	2.43/	1.83/		2.29/	
		Intermediate Growth Boundaries					2.14/	2.71/	2.43/	2.14/				
		Urban Development Reserves						2.57/	2.71/	2.43/			2.29/	
		Urban Service Areas/Boundaries (USA or USB)(2/*)(+2:0)						2.67/	2.43/	2.29/				2.43/
		State Capital Investment Priorities (Priority Funding Areas)						2.2/		2.0/	2.29/		2.14/	2.57/
		Development Policy Areas						2.0/	2.0/	2.0/	1.86/		2.0/	
		Land Use Information Systems						1.5/	1.86/	1.86/				2.29/
	Compact Development(1.58/1)(+6:1)	Infill Development(2/*)(1:1)	2.43/	2.29/		1.29/	2.29/	2.29/	2.0/	2.14/	2.14/	2.43/	2.71/	
		Cluster Development		1.71/		1.29/	2.0/	2.71/	2.29/	2.29/			1.86/	
		Brownfield Redevelopment					1.71/	2.57/	2.0/	2.29/	2.29/	2.0/	2.29/	
	Zoning Approaches(2/*)(+1:0)	Mixed-Use Land Development	2.29/	2.43/	1.86/		2.57/	2.67/	1.57/	1.86/	2.29/		2.71/	
		Planned Unit Development (PUD)					1.43/	2.2/	1.43/	1.57/			1.71/	
		Overlay Zoning/Districts		1.67/	1.67/		1.86/	2.0/	1.71/		1.57/		1.86/	
		Minimum Density Zoning/Standards(3/0.5)(1:1)		1.67/			2.29/	1.5/	1.86/				2.0/	
		Upzoning/Downzoning(0.5/*)(+1:0)					2.0/	2.28/	2.0/					
		Rehabilitation Zoning Codes					1.6/	2.0/						
		Inclusionary Zoning(2/*)(+1:0)					1.83/	2.14/				2.86/	2.29/	
		Interim Zoning					1.17/	1.86/						
		Floating Zones					1.33/	1.57/			1.5/			
	Property Taxation(2/2)(+2:1)	Targeted Tax Abatement						1.71/			2.0/		2.2/	
		Split-Rate Property Tax						2.29/	1.75/	1.5/	2.5/	2.25/	2.0/	
	Extrajurisdictional Controls and Agreements	Extraterritorial Jurisdiction				1.83/		2.14/	2.33/					2.33/
		Annexation and Municipal Incorporation(1/1)(1:1)						2.0/	2.0/					2.29/
		Interjurisdictional Agreements(1.5/*)(+2:0)						1.29/	1.67/					2.5/
		Tax-Base Sharing						1.86/	1.67/		2.29/	2.86/	2.43/	2.67/
		Developments of Regional Impact (DRI)			1.86/	2.0/		1.86/		1.57/		1.57/		2.5/
Natural Resource Preservation	Land Preservation	Land Acquisition and Banking				1.17/		1.71/	2.86/	2.29/			2.5/	
		Transferable Development Rights (TDR)(1.1/1)(4:1)						2.0/	2.57/	2.14/			2.4/	
		Purchase of Development Rights (PDR)(2/2)(-2:1)						2.5/	2.57/	2.14/			2.4/	
		Conservation Easements(2/*)(+1:0)						2.29/	2.71/	2.43/			2.4/	
		Farmland Preservation Credits						2.0/	2.0/	1.83/	1.57/			
		Differential Assessment Programs						2.14/	2.0/	1.6/	1.29/	1.67/		
		Agricultural and Forest Programs(1/*)(+1:0)						1.86/	2.14/	2.0/	1.29/	1.33/		
		Sensitive Area Zoning						2.57/	2.43/				2.0/	
	Water Protection	Water Quality Protection Programs						2.29/	2.57/	2.67/			1.83/	
		Water Quantity Protection Programs											1.83/	
Facility Adequacy, Timing, and Planning	Facility Planning	Capital Improvement Programs (CIP)(2./2)(+2:1)				2.43/		2.29/	2.0/	1.86/	2.17/			2.16/
	Facility Adequacy	Adequate Public Facility (APF) Standards/Requirements				2.57/		2.43/	1.83/	1.57/				
	Facility Financing	Development Exactions				2.33/		2.17/	1.67/	1.57/			1.83/	
		Impact Fees(1.9/1.8)(+1.6:1)				2.33/		1.8/	1.67/	1.43/			1.83/	
		Special Financing Districts				2.17/		2.29/	1.5/	1.43/		1.17/	2.0/	
		Cost-based Utility and Stormwater Fees						2.0/			1.83/	1.5/		
	Growth Limits/Controls	Growth-Phasing Systems for Public Facilities(1.5/1.7)(-2.5:1)				2.43/		2.0/	2.29/	1.67/			1.71/	2.14/
		Development Caps and Rate Allocation Systems(*/2.4)(-5:0)				2.29/		2.0/	2.43/	2.17/			2.0/	
		Carrying Capacity Limitations				2.0/		2.0/	2.57/	2.43/			2.17/	
		Moratoriums and Interim Development Regulations						1.57/	2.14/	2.17/		1.0/		1.83/
Coordinating and Integrating Processes, Plans, and Functional Assignments(1/*)(+3:0)	Plans	State Development Plans(1.5/*)(+2:0)				1.83/		1.57/	2.57/	2.17/	2.33/		2.17/	2.67/
		Comprehensive Plans		1.33/		2.0/	2.17/	1.5/	2.43/	2.33/	2.17/		2.33/	2.33/
		Specific-Area Development Plans	1.8/		2.0/	2.0/	2.4/	2.0/	2.5/	2.4/	2.2/		2.2/	2.4/
		Strategic Policy Plans	1.75/	1.33/	1.75/	1.8/	2.2/	2.14/	2.17/	2.0/	2.2/	2.0/	2.0/	2.2/
	Processes	Streamlined Permit Processing						2.57/	1.43/		2.17/			1.8/
		Vertical Plan Consistency Requirements(2/3)(+2:1)				1.57/		2.71/	2.29/	2.17/		1.57/		2.17/
		Horizontal Plan Consistency Requirements(*/3)(-1:0)				1.67/		2.14/	2.29/	2.17/		1.5/		2.17/
		Cross-Acceptance Process				1.8/		2.43/	2.4/	2.25/	2.25/	1.5/		2.6/
		Comprehensive Plan Consistency Requirements				1.86/		2.29/	2.14/	2.17/		1.43/		2.17/
		State Policy Assessment	2.0/	1.8/	1.8/	1.6/	2.0/	2.33/	2.0/	1.8/	2.2/	1.5/	2.0/	2.2/
	Functional Assignments	Regional Growth Management Hearing Board				1.6/		2.33/	2.4/	2.25/	2.0/	2.2/		2.8/
		Regional Planning Councils(1.5/*)(+2:0)				1.5/		1.86/	2.0/	1.8/	1.6/	1.83/		2.5/
		Regional Service Provider				1.83/		1.71/	1.67/	1.4/	1.8/	2.0/		2.5/

Effectiveness Coding(grade)

V(3) - Very effective tool or policy action in achieving the corresponding goal (look at the field or column)
S(2) - Somewhat effective tool or policy action in achieving the corresponding goal
N(1) - Not effective at all in achieving the corresponding goal
N/A(missing value) - Not applicable or no knowledge of its use

**In lit review grade, grade form: (A/B) (+C: 1) is used, A: mean value for positive findings, B:
For this, we used following weight from Evidence

- M (multivariate analysis = 3
- C (case study) = 2
- T(theory)/S(simulation) = 1
- A(anecdotal) = .5

MATRIX C-4B_1 Effectiveness Matrix (Expert*)

Goals of Growth Management-related Strategies and Policy Actions

Strategy		Policy Action/Tool(lit review score (Mean)(Ratio))**	a: Provide Transportation Choices.	b: Reduce Auto VMT.	c: Manage Congestion.	d: Ensure Adequate Level-of-Service.	e: Promote Land Use Accessibility	f: Manage Expansion of Urbanized Area.	g: Preserve Natural Resources and Open Space.	h: Minimize Environmental Impacts.	i: Promote Economic Vitality.	j: Promote Social Equity.	k: Strengthen Community Livability.	l: Strengthen Coordination.
Urban Containment Strategies(2.2/*)(+5:0)	Targeted Growth	Urban Growth Boundaries (UGB)(2.1/1.5)(+4.5:1)		High			Medium	High	High	High	Low		High	
		Intermediate Growth Boundaries					Medium	High	High	Medium				
		Urban Development Reserves						Medium	High	High			High	
		Urban Service Areas/Boundaries (USA or USB)(2/*)(+2:0)						High	High	High				High
		State Capital Investment Priorities (Priority Funding Areas)						Medium		Medium	High		Medium	High
		Development Policy Areas						Medium	Medium	Medium	Medium		Medium	
		Land Use Information Systems						Low	Medium	Medium				High
	Compact Development(1.58/1)(+6:1)	Infill Development(2/*)(1:1)	High	High		Low	High	High	Medium	Medium	Medium	High	High	
		Cluster Development		Low		Low	Medium	Medium	High	High			Medium	
		Brownfield Redevelopment					Low	Medium	Medium	High	High	Medium	High	
	Zoning Approaches(2/*)(+1:0)	Mixed-Use Land Development	High	High	Medium		High	Medium	Low	Medium	High		High	
		Planned Unit Development (PUD)					Low	Low	Low	Low			Low	
		Overlay Zoning/Districts		Low	Low		Medium	Low	Low		Low		Medium	
		Minimum Density Zoning/Standards(3/0.5)(1:1)		Low			High	High	Medium				Medium	
		Upzoning/Downzoning(0.5/*)(+1:0)					Medium	Medium	Medium					
		Rehabilitation Zoning Codes					Low	Medium						
		Inclusionary Zoning(2/*)(+1:0)					Low	Low				High	High	
		Interim Zoning					Low	Medium						
		Floating Zones					Low	Medium			Low			
	Property Taxation(2/2)(+2:1)	Targeted Tax Abatement						Low			Medium		Medium	
		Split-Rate Property Tax						Medium	Low	Low	High	Medium	Medium	
	Extrajurisdictional Controls and Agreements	Extraterritorial Jurisdiction				Low		Medium	High					High
		Annexation and Municipal Incorporation(1/1)(1:1)						High	Medium					High
		Interjurisdictional Agreements(1.5/*)(+2:0)						Medium	Low					High
		Tax-Base Sharing						Medium	Low		High	High	High	High
		Developments of Regional Impact (DRI)			Medium	Medium		Medium		Low		Low		High
Natural Resource Preservation	Land Preservation	Land Acquisition and Banking				Low		High	High	High			High	
		Transferable Development Rights (TDR)(1.1/1)(4:1)						High	High	Medium			High	
		Purchase of Development Rights (PDR)(2/2)(-2:1)						High	High	Medium			High	
		Conservation Easements(2/*)(+1:0)						High	High	High			High	
		Farmland Preservation Credits						Medium	Medium	Low	Low			
		Differential Assessment Programs						Low	Medium	Low	Low	Low		
		Agricultural and Forest Programs(1/*)(+1:0)						High	Medium	Medium	Low	Low		
		Sensitive Area Zoning						Medium	High				Medium	
	Water Protection	Water Quality Protection Programs						Medium	High	High			Low	
		Water Quantity Protection Programs											Low	
Facility Adequacy, Timing, and Planning	Facility Planning	Capital Improvement Programs (CIP)(2./2)(+2:1)				High		Medium	Medium	Medium	Medium			Medium
	Facility Adequacy	Adequate Public Facility (APF) Standards/Requirements				High		Medium	Low	Low				
	Facility Financing	Development Exactions				High		Low	Low	Low			Low	
		Impact Fees(1.9/1.8)(+1.6:1)				High		Low	Low	Low			Low	
		Special Financing Districts				Medium		Low	Low	Low		Low	Low	
		Cost-based Utility and Stormwater Fees						Medium			Low	Low		
	Growth Limits/Controls	Growth-Phasing Systems for Public Facilities(1.5/1.7)(-2.5:1)				High		Medium	High	Low			Low	Medium
		Development Caps and Rate Allocation Systems(*/2.4)(-5:0)				High		High	High	Medium			Medium	
		Carrying Capacity Limitations				Medium		High	High	High			Medium	
		Moratoriums and Interim Development Regulations						Medium	Medium	Medium		Low		Low
Coordinating and Integrating Processes, Plans, and Functional Assignments(1/*)(+3:0)	Plans	State Development Plans(1.5/*)(+2:0)				Low		High	High	Medium	High		Medium	High
		Comprehensive Plans		Low		Medium	Medium	High	High	High	Medium		High	High
		Specific-Area Development Plans	Low		Medium	Medium	High	High	High	High	Medium		Medium	High
		Strategic Policy Plans	Low	Low	Low	Low	Medium	High	Medium	Medium	Medium	Medium	Medium	Medium
	Processes	Streamlined Permit Processing						Low	Low		Medium			Low
		Vertical Plan Consistency Requirements(2/3)(+2:1)				Low		High	High	Medium		Low		Medium
		Horizontal Plan Consistency Requirements(*/3)(-1:0)				Low		Medium	High	Medium		Low		Medium
		Cross-Acceptance Process				Low		High	High	Medium	Medium	Low		High
		Comprehensive Plan Consistency Requirements				Medium		High	Medium	Medium		Low		Medium
		State Policy Assessment	Medium	Low	Low	Low	Low	High	Medium	Low	Medium	Low	Medium	Medium
	Functional Assignments	Regional Growth Management Hearing Board				Low		High	High	Medium	Medium	Medium		High
		Regional Planning Councils(1.5/*)(+2:0)				Low		Medium	Medium	Low	Low	Low		High
		Regional Service Provider				Low		Low	Low	Low	Low	Medium		High

Effectiveness Coding(grade)

V(3) - Very effective tool or policy action in achieving the corresponding goal (look at the field or column)
S(2) - Somewhat effective tool or policy action in achieving the corresponding goal
N(1) - Not effective at all in achieving the corresponding goal
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* The expert grade is converted to a qualitative version based on HIGH, MEDIUM and LOW, using the 33% and 66% percentile cut points
**In lit review grade, grade form: (A/B) (+C: 1) is used, A: mean value for positive findings, B: mean value for negative findings, (+C:1) means ratio between positive findings and negative findings in numbers, Plus (+) refers to more positive findings a

For this, we used following weight from Evidence

- M (multivariate analysis = 3
- C (case study) = 2
- T(theory)/S(simulation) = 1
- A(anecdotal) = .5

Matrix C-4C Goals of Transportation related Strategies and Policy Actions

Strategy		Policy Action/Tool	Provide Transportation Choices.	Reduce Auto VMT.	Manage Congestion.	Ensure Adequate Level-of-Service.	Promote Land Use Accessibility	Manage Expansion of Urbanized Area.	Preserve Natural Resources and Open Space.	Minimize Environmental Impacts.	Promote Economic Vitality.	Promote Social Equity.	Strengthen Community Livability.	Strengthen Coordination.
Transportation-Efficient Land Use Planning and Development Strategies		Rail-Based Transit-Oriented Development (TOD)	-	P			-	-		-	-		-	
		Bus-Based Transit-Oriented Development (TOD)	-	-			-	-		-			-	
		Traditional Neighborhood Development (TND)	-	-			-	-		-	-		-	
		Main Street Program (Downtown Revitalization)	-	-			-	-		-	P	-	-	
		Neighborhood Conservation Program				-		-		-	S	-	-	
		Jobs-Housing Balance Programs		-	-	-	-	-		-		-		
		Corridor Preservation and Planning				-	-	-		-	P		-	-
		Access Management Program		-	-	-	-			-	-			
		Parking Supply Management: Flexible Requirements	-	-	S	-				-			-	
		Parking Restrictions: Area-wide Parking Caps		-	-					-				
Pricing Strategies	Automobiles / Roadways	Parking Demand Management		-	-					-				
		Gasoline Tax Increase		-	-					-		-		
		Road Pricing: Toll Roads		-	P	-				-				
		Congestion Pricing: High Occupancy Toll (HOT) Lanes		-	-	-				-		-		
		Congestion Pricing: Area-Wide or Cordon Pricing		-	-	-				-				
		Congestion Pricing by Automatic Vehicle Identification (AVI)		-	-	-				-				
		Distance-based Taxes		-	-					-		-		
	Transit	Transit Fare Adjustment	-	-	-							-		
Alternative Mode Support Strategies	Facility and Systems Improvements	Traffic Calming	-	-						-			S	
		Alternative Roadway Design Standards	-			-	-		-	-			-	
		High Occupancy Vehicle (HOV) Facilities	-	-	P	-				-				
		Bus Transit Service Improvement	-	S		-	-			-		-		
		Custom Transit Services	-	-		-						-		
		Non-Motorized Mode Facility Support	S	-						-		-	-	
		Park & Ride Lots	P	-	-	-								
		Transportation Enhancements Program	-	-			-			-			-	
		Carsharing and Ridematching Services	-	-	P	-								
		Vanpooling and Ridematching Services	-	-	P	-								
		Information Technology Applications for Transit and Ridesharing Modes	-	-	-	-								
	Capital Investments	Light Rail Transit (LRT) Investments	-	P	-	-			-	-	-	-	-	
		Bus Rapid Transit (BRT) Investments	-	S	-	-			-	-	-	-		
		Commuter/Heavy Rail Transit Investments	-	P	-	-			-	-	-	-		
	Public Education	Public Education and Promotion for Alternative Modes	P	-						-				
Worksite-Based Strategies		Monetary Incentives for Alternative Mode Use	-	-	S					-				
		Alternative Work Schedules	-	-	-					-				
		Worksite Parking Management	-	-	-					-				
		Employment-Based Proximate Commuting Program	-	-	-		-			-				
		On-Site Facility Amenities Provision	-	-			-			-				
		Transportation Management Associations	-	-	-					-	-			-
											-	-	-	-
Objective-Based Strategies	Incentives	Location Efficient Mortgages (LEM)	-	-			-	-		-	-	-	-	
		Live Near Your Work Program	-	-	-		-			-				
	Service Provisions	Job Access and Reverse Commute Program	-				-				-	-		
Roadway Investment Strategies		Fix-It-First Strategies for Roadways Investment				-		-		-	-			
														-
Coordinating and Integrating Processes, Plans, and Functional Assignments		Performance Measures Tied to Growth Management Goals				-		-						-
		Coordinated Plan Review Process						-					-	-
		Trip Reduction Ordinances and Programs	-	-	-					-		-		-
		Funding Allocation Systems Tied to Growth Management Goals	-			-		-			-		-	-
		Land Use Expert Panels						-						-
		Transportation and Growth Management (TGM) Joint Program/Consortium	-	-		-		-						-

P: primary, S: secondary

Matrix C-4D Dallas Matrix for Growth Management related Strategies and Policy Actions

Strategies		Policy Tools	Provide Transportation Choices.	Reduce Auto VMT.	Manage Congestion.	Ensure Adequate Level-of-Service.	Promote Land Use Accessibility	Manage Expansion of Urbanized Area.	Preserve Natural Resources and Open Space.	Minimize Environmental Impacts.	Promote Economic Vitality.	Promote Social Equity.	Strengthen Community Livability.	Strengthen Coordination.
Urban Containment Strategies	Targeted Growth	Urban Growth Boundaries (UGB)		-			-	-	-	-	-		-	
		Intermediate Growth Boundaries					-	-	-	-				
		Urban Development Reserves						-	-	-			-	
		Urban Service Areas/Boundaries (USA or USB)						-	-	-				-
		State Capital Investment Priorities (Priority Funding Areas)						-		-	-		-	-
		Development Policy Areas						-	-	-	-		-	
		Land Use Information Systems						-	-	-				-
	Compact Development	Infill Development	-	-		-	-	-	-	-	**S**	-	-	
		Cluster Development		-		-	-	-	-	-			-	
		Brownfield Redevelopment					-	-	-	-	**P**	-	-	
	Zoning Approaches	Mixed-Use Land Development	-	-	-		-	-	-	-	**P**		-	
		Planned Unit Development (PUD)					**S**	-	-	-			-	
		Overlay Zoning/Districts		-	-		-	-	-		-		-	
		Minimum Density Zoning/Standards		-			-	-	-				-	
		Upzoning/Downzoning					-	-	-					
		Rehabilitation Zoning Codes					-	-						
		Inclusionary Zoning					-	-				-	-	
		Interim Zoning					-	-						
		Floating Zones					-	-			-			
	Property Taxation	Targeted Tax Abatement						-			-		**P**	
		Split-Rate Property Tax						-	-	-	-	-	-	
	Extrajurisdictional Controls and Agreements	Extraterritorial Jurisdiction				**S**		-	-					-
		Annexation and Municipal Incorporation						-	-					-
		Interjurisdictional Agreements						-	-					**P**
		Tax-Base Sharing						-	-		-	-	-	-
		Developments of Regional Impact (DRI)			-	-		-		-		-		-
Natural Resource Preservation	Land Preservation	Land Acquisition and Banking				-		**P**	**P**	**P**			**S**	
		Transferable Development Rights (TDR)						**P**	**P**	**P**			**S**	
		Purchase of Development Rights (PDR)						**P**	**P**	**P**			**S**	
		Conservation Easements						**P**	**P**	**P**			**S**	
		Farmland Preservation Credits						**P**	**P**	**P**	**S**			
		Differential Assessment Programs						-	-	-	-	-		
		Agricultural and Forest Programs						**P**	**P**	**P**	**S**	**S**		
		Sensitive Area Zoning						**P**	**P**				**S**	
	Water Protection	Water Quality Protection Programs						**P**	**P**	**P**			**S**	
		Water Quantity Protection Programs											**S**	
Facility Adequacy, Timing, and Planning	Facility Planning	Capital Improvement Programs (CIP)				-		-	-	-	**P**			-
	Facility Adequacy	Adequate Public Facility (APF) Standards/Requirements				-		-	-	-				
	Facility Financing	Development Exactions				-		-	-	-			-	
		Impact Fees				-		-	-	-			-	
		Special Financing Districts / FPIP				-		-	-	-	-	-	-	
		Cost-based Utility and Stormwater Fees						-			-	-		
	Growth Limits/Controls	Growth-Phasing Systems for Public Facilities				-		-	-	-			-	-
		Development Caps and Rate Allocation Systems				-		-	-	-			-	
		Carrying Capacity Limitations				-		-	-	-			-	
		Moratoriums and Interim Development Regulations						-	-	-		-		-
Coordinating and Integrating Processes, Plans, and Functional Assignments	Plans	State Development Plans				-		-	-	-	-		-	-
		Comprehensive Plans		-		-	-	-	-	-	-		-	**P**
		Specific-Area Development Plans	-		-	-	-	-	-	-	**P**	-	-	-
		Strategic Policy Plans	-	-	-	-	-	-	-	-	-	-	-	-
	Processes	Streamlined Permit Processing						-	-		-			-
		Vertical Plan Consistency Requirements				-		-	-	-		-		-
		Horizontal Plan Consistency Requirements				-		-	-	-		-		-
		Cross-Acceptance Process				-		-	-	-	-	-		-
		Comprehensive Plan Consistency Requirements				-		-	-	-		-		-
		State Policy Assessment	-	-	-	-	-	-	-	-	-	-	-	-
	Functional Assignments	Regional Growth Management Hearing Board				-		-	-	-	-	-		-
		Regional Planning Councils				-		-	-	-	-	-		**P**
		Regional Service Provider / Standards				-		-	-	-	-	-		-

P: primary, S: secondary

Matrix C-4E Metro Matrix for Transportation related Strategies and Policy Actions

Strategy		Policy Action/Tool	Provide Transportation Choices.	Reduce Auto VMT.	Manage Congestion.	Ensure Adequate Level-of-Service.	Promote Land Use Accessibility	Manage Expansion of Urbanized Area.	Preserve Natural Resources and Open Space.	Minimize Environmental Impacts.	Promote Economic Vitality.	Promote Social Equity.	Strengthen Community Livability.	Strengthen Coordination.
Transportation-Efficient Land Use Planning and Development Strategies		Rail-Based Transit-Oriented Development (TOD)	P	P			P	-		S	S		S	
		Bus-Based Transit-Oriented Development (TOD)	S	S			S	-		S			S	
		Traditional Neighborhood Development (TND)	-	-			-	S		-	-		P	
		Main Street Program (Downtown Revitalization)	S	-			-	-		-	P	-		
		Neighborhood Conservation Program				S		-		-	S	-	P	
		Jobs-Housing Balance Programs		P	P	-	-	-		S		-		
		Corridor Preservation and Planning				-	-	S		-	P		-	-
		Access Management Program		-	-	-	P			-	-			
		Parking Supply Management: Flexible Requirements	S	-	-	-				S			-	
		Parking Restrictions: Area-wide Parking Caps		-	S					S			S	
Pricing Strategies	Automobiles / Roadways	Parking Demand Management		S	S					-				
		Gasoline Tax Increase		-	-					S		-		
		Road Pricing: Toll Roads		-	-	-				-				
		Congestion Pricing: High Occupancy Toll (HOT) Lanes		-	-	-				-		-		
		Congestion Pricing: Area-Wide or Cordon Pricing		-	-	-				-				
		Congestion Pricing by Automatic Vehicle Identification (AVI)		-	-	-				-				
		Distance-based Taxes		-	-					-		-		
	Transit	Transit Fare Adjustment	-	-	-							-		
Alternative Mode Support Strategies	Facility and Systems Improvements	Traffic Calming	-	S						-			-	
		Alternative Roadway Design Standards	S			-	S		-	-			P	
		High Occupancy Vehicle (HOV) Facilities	-	-	-	-				-				
		Bus Transit Service Improvement	S	-		P	S			-		-		
		Custom Transit Services	-	-		S						S		
		Non-Motorized Mode Facility Support	-	P						S		-	P	
		Park & Ride Lots	P	P	S	S								
		Transportation Enhancements Program	-	-			-			-			-	
		Carsharing and Ridematching Services	-	-	-	-								
		Vanpooling and Ridematching Services	-	-	-	-								
		Information Technology Applications for Transit and Ridesharing Modes	-	-	-	-								
	Capital Investments	Light Rail Transit (LRT) Investments	P	P	S	-			-	S	-	-	S	
		Bus Rapid Transit (BRT) Investments	P	S	-	-			-	-	-	-		
		Commuter/Heavy Rail Transit Investments	P	P	-	-			-	S	-	-		
	Public Education	Public Education and Promotion for Alternative Modes	S	S						-				
Worksite-Based Strategies		Monetary Incentives for Alternative Mode Use	S	S	-					-				
		Alternative Work Schedules	-	-	S					-				
		Worksite Parking Management	-	-	-					-				
		Employment-Based Proximate Commuting Program	-	S	-		-			-				
		On-Site Facility Amenities Provision	-	-			-			-				
		Transportation Management Associations	-	-	-					-	-			-
											-	-	-	-
Objective-Based Strategies	Incentives	Location Efficient Mortgages (LEM)	-	-			-	-		-	-	-	-	
		Live Near Your Work Program	-	-	-		-			-				
	Service Provisions	Job Access and Reverse Commute Program	-				-				-	-		
Roadway Investment Strategies		Fix-It-First Strategies for Roadways Investment				-		-		-	-			
														-
Coordinating and Integrating Processes, Plans, and Functional Assignments		Performance Measures Tied to Growth Management Goals				S		S						S
		Coordinated Plan Review Process						-					-	S
		Trip Reduction Ordinances and Programs	-	P	S					-		-		-
		Funding Allocation Systems Tied to Growth Management Goals	P			-		-			-		-	-
		Land Use Expert Panels						-						-
		Transportation and Growth Management (TGM) Joint Program/Consortium	P	P		-		-						S

P: primary, S: secondary

Matrix C-4F

Metro Matrix for Growth Management related Strategies and Policy Actions

Strategies		Policy Tools	Provide Transportation Choices.	Reduce Auto VMT.	Manage Congestion.	Ensure Adequate Level-of-Service.	Promote Land Use Accessibility	Manage Expansion of Urbanized Area.	Preserve Natural Resources and Open Space.	Minimize Environmental Impacts.	Promote Economic Vitality.	Promote Social Equity.	Strengthen Community Livability.	Strengthen Coordination.
Urban Containment Strategies	Targeted Growth	Urban Growth Boundaries (UGB)		S			-	P	P	-	-		-	
		Intermediate Growth Boundaries					-	S	S	-				
		Urban Development Reserves						S	S	-			-	
		Urban Service Areas/Boundaries (USA or USB)						S	-	-				-
		State Capital Investment Priorities (Priority Funding Areas)						-		-	P		P	-
		Development Policy Areas						-	-	-	-		-	
		Land Use Information Systems						-	-	-				-
	Compact Development	Infill Development	-	-		S	-	P	S	S	S	P	P	
		Cluster Development		-		S	-	S	S	P			S	
		Brownfield Redevelopment					-	S	S	S	-	-	-	
	Zoning Approaches	Mixed-Use Land Development	S	P	S		-	S	-	-	P		P	
		Planned Unit Development (PUD)					-	S	S	S			S	
		Overlay Zoning/Districts		-	-		-	-	-		-		-	
		Minimum Density Zoning/Standards		-			-	P	S				S	
		Upzoning/Downzoning					-	-	-					
		Rehabilitation Zoning Codes					-	-						
		Inclusionary Zoning					-	-				-	-	
		Interim Zoning					-	S						
		Floating Zones					-	S			-			
	Property Taxation	Targeted Tax Abatement						-			P		S	
		Split-Rate Property Tax						-	-	-	-	-	-	
	Extrajurisdictional Controls and Agreements	Extraterritorial Jurisdiction				-		-	-					-
		Annexation and Municipal Incorporation						-	-					-
		Interjurisdictional Agreements						S	-					P
		Tax-Base Sharing						-	-		S	-	-	S
		Developments of Regional Impact (DRI)			-	-		-		-		-		-
Natural Resource Preservation	Land Preservation	Land Acquisition and Banking				-		S	-	-			-	
		Transferable Development Rights (TDR)						S	P	P			-	
		Purchase of Development Rights (PDR)						-	P	P			-	
		Conservation Easements						-	S	S			S	
		Farmland Preservation Credits						-	-	-	-			
		Differential Assessment Programs						-	-	-	-	-		
		Agricultural and Forest Programs						-	-	-	-	-		
		Sensitive Area Zoning						-	-				-	
	Water Protection	Water Quality Protection Programs						-	-	P			S	
		Water Quantity Protection Programs											P	
Facility Adequacy, Timing, and Planning	Facility Planning	Capital Improvement Programs (CIP)				S		-	-	-	P			S
	Facility Adequacy	Adequate Public Facility (APF) Standards/Requirements				P		P	-	-				
	Facility Financing	Development Exactions				-		-	-	-			-	
		Impact Fees				-		-	-	-			-	
		Special Financing Districts / FPIP				P		S	-	-	S	-	-	
		Cost-based Utility and Stormwater Fees						-			-	-		
	Growth Limits/Controls	Growth-Phasing Systems for Public Facilities				-		-	-	-			-	-
		Development Caps and Rate Allocation Systems				-		-	-	-			-	
		Carrying Capacity Limitations				-		-	-	-			-	
		Moratoriums and Interim Development Regulations						S	-	-		-		-
Coordinating and Integrating Processes, Plans, and Functional Assignments	Plans	State Development Plans				-		-	-	-	-		-	-
		Comprehensive Plans		P		P	P	P	P	P	-		P	P
		Specific-Area Development Plans	-	-	-	S	-	-	-	S	S	S	P	-
		Strategic Policy Plans	-	-	-	-	-	-	-	-	-	-	-	-
	Processes	Streamlined Permit Processing						S	-		-			S
		Vertical Plan Consistency Requirements				-		-	-	-		-		-
		Horizontal Plan Consistency Requirements				-		-	-	-		-		-
		Cross-Acceptance Process				-		-	-	-	-	-		S
		Comprehensive Plan Consistency Requirements				S		S	S	S		-		S
		State Policy Assessment	-	-	-	-	-	-	-	-	-	-	-	-
	Functional Assignments	Regional Growth Management Hearing Board				-		-	-	-	-	-		S
		Regional Planning Councils				-		-	S	-	-	-		P
		Regional Service Provider / Standards				P		S	-	-	-	-		S

P: primary, S: secondary

Matrix C-4G MDOT Matrix for Transportation related Strategies and Policy Actions

Strategy		Policy Action/Tool	Provide Transportation Choices.	Reduce Auto VMT.	Manage Congestion.	Ensure Adequate Level-of-Service.	Promote Land Use Accessibility	Manage Expansion of Urbanized Area.	Preserve Natural Resources and Open Space.	Minimize Environmental Impacts.	Promote Economic Vitality.	Promote Social Equity.	Strengthen Community Livability.	Strengthen Coordination.
Transportation-Efficient Land Use Planning and Development Strategies		Rail-Based Transit-Oriented Development (TOD)	P	P			P	-			-		-	
		Bus-Based Transit-Oriented Development (TOD)	P	P			P	-		-			-	
		Traditional Neighborhood Development (TND)	-	-			-	-		-	-		-	
		Main Street Program (Downtown Revitalization)	-	-			-	-		-	-	-	-	
		Neighborhood Conservation Program				P		-		-	P	-	P	
		Jobs-Housing Balance Programs		-	-	-	-	-		-		-		
		Corridor Preservation and Planning				P	-	-		-	-		-	-
		Access Management Program		-	-	-	P			-	-			
		Parking Supply Management: Flexible Requirements	-	-	-	-				-			-	
		Parking Restrictions: Area-wide Parking Caps		-	-					-				
Pricing Strategies	Automobiles / Roadways	Parking Demand Management		-	-					-				
		Gasoline Tax Increase		-	-					-		-		
		Road Pricing: Toll Roads		-	-	-				-				
		Congestion Pricing: High Occupancy Toll (HOT) Lanes		-	-	-				-		-		
		Congestion Pricing: Area-Wide or Cordon Pricing		-	-	-				-				
		Congestion Pricing by Automatic Vehicle Identification (AVI)		-	-	-				-				
		Distance-based Taxes		-	-					-		-		
	Transit	Transit Fare Adjustment	-	-	-							-		
Alternative Mode Support Strategies	Facility and Systems Improvements	Traffic Calming	-	-						-			-	
		Alternative Roadway Design Standards	-			-	-		-	-			-	
		High Occupancy Vehicle (HOV) Facilities	-	-	-	-				-				
		Bus Transit Service Improvement	-	-		-	-			-		-		
		Custom Transit Services	-	-		-						-		
		Non-Motorized Mode Facility Support	-	-						-		-	-	
		Park & Ride Lots	-	-	-	-								
		Transportation Enhancements Program	P	-			-			P			-	
		Carsharing and Ridematching Services	-	-	-	-								
		Vanpooling and Ridematching Services	-	-	-	-								
		Information Technology Applications for Transit and Ridesharing Modes	-	-	-	-								
	Capital Investments	Light Rail Transit (LRT) Investments	P	P	-	-			-	-	-	-	-	
		Bus Rapid Transit (BRT) Investments	P	P	-	-			-	-	-	-		
		Commuter/Heavy Rail Transit Investments	-	-	-	-			-	-	-	-		
	Public Education	Public Education and Promotion for Alternative Modes	-	-						-				
Worksite-Based Strategies		Monetary Incentives for Alternative Mode Use	-	-	-					-				
		Alternative Work Schedules	-	-	-					-				
		Worksite Parking Management	-	-	-					-				
		Employment-Based Proximate Commuting Program	-	-	P		-			S				
		On-Site Facility Amenities Provision	-	-			-			-				
		Transportation Management Associations	-	-	-					-	-			-
											-	-	-	-
Objective-Based Strategies	Incentives	Location Efficient Mortgages (LEM)	-	-			-	-		-	-	-	-	
		Live Near Your Work Program	-	P	-		-			S				
	Service Provisions	Job Access and Reverse Commute Program	-				-				-	-		
Roadway Investment Strategies		Fix-It-First Strategies for Roadways Investment				-		-		-	-			
														-
Coordinating and Integrating Processes, Plans, and Functional Assignments		Performance Measures Tied to Growth Management Goals				-		-						-
		Coordinated Plan Review Process						-					-	P
		Trip Reduction Ordinances and Programs	-	-	-					-		-		-
		Funding Allocation Systems Tied to Growth Management Goals	-			-		-			-		-	-
		Land Use Expert Panels						P						P
		Transportation and Growth Management (TGM) Joint Program/Consortium	-	-		-		-						-

P: primary, S: secondary

Matrix C-4H MDOT Matrix for Growth Management related Strategies and Policy Actions

Strategies		Policy Tools	Provide Transportation Choices.	Reduce Auto VMT.	Manage Congestion.	Ensure Adequate Level-of-Service.	Promote Land Use Accessibility	Manage Expansion of Urbanized Area.	Preserve Natural Resources and Open Space.	Minimize Environmental Impacts.	Promote Economic Vitality.	Promote Social Equity.	Strengthen Community Livability.	Strengthen Coordination.
Urban Containment Strategies	Targeted Growth	Urban Growth Boundaries (UGB)		-			-	-	-	-	-		-	
		Intermediate Growth Boundaries					-	-	-	-				
		Urban Development Reserves						-	-	-			-	
		Urban Service Areas/Boundaries (USA or USB)						-	-	-				-
		State Capital Investment Priorities (Priority Funding Areas)						P		S	P		S	-
		Development Policy Areas						-	-	-	-		-	
		Land Use Information Systems						-	-	-				-
	Compact Development	Infill Development	-	-		-	-	-	-	-	-	-	-	
		Cluster Development		-		-	-	-	-	-			-	
		Brownfield Redevelopment					-	-	S	-	P	-	-	
	Zoning Approaches	Mixed-Use Land Development	-	-	-		-	-	-	-	-		-	
		Planned Unit Development (PUD)					-	-	-	-			-	
		Overlay Zoning/Districts		-	-		-	-	-		-		-	
		Minimum Density Zoning/Standards		-			-	-	-				-	
		Upzoning/Downzoning					-	-	-					
		Rehabilitation Zoning Codes					-	-						
		Inclusionary Zoning					-	-				-	-	
		Interim Zoning					-	-						
		Floating Zones					-	-			-			
	Property Taxation	Targeted Tax Abatement						-			P		-	
		Split-Rate Property Tax						-	-	-	-	-	-	
	Extrajurisdictional Controls and Agreements	Extraterritorial Jurisdiction				-		-	-					-
		Annexation and Municipal Incorporation						-	-					-
		Interjurisdictional Agreements						-	-					-
		Tax-Base Sharing						-	-		-	-	-	-
		Developments of Regional Impact (DRI)			-	-		-		-		-		-
Natural Resource Preservation	Land Preservation	Land Acquisition and Banking				-		S	P	P			-	
		Transferable Development Rights (TDR)						-	-	-			-	
		Purchase of Development Rights (PDR)						-	-	-			-	
		Conservation Easements						-	-	-			-	
		Farmland Preservation Credits						-	-	-	-			
		Differential Assessment Programs						-	-	-	-	-		
		Agricultural and Forest Programs						-	-	-	-	-		
		Sensitive Area Zoning						-	-				-	
	Water Protection	Water Quality Protection Programs						-	-	-			-	
		Water Quantity Protection Programs											-	
Facility Adequacy, Timing, and Planning	Facility Planning	Capital Improvement Programs (CIP)				-		-	-	-	-			-
	Facility Adequacy	Adequate Public Facility (APF) Standards/Requirements				-		-	-	-				
	Facility Financing	Development Exactions				-		-	-	-			-	
		Impact Fees				-		-	-	-			-	
		Special Financing Districts / FPIP				-		-	-	-	-	-	-	
		Cost-based Utility and Stormwater Fees						-			-	-		
	Growth Limits/Controls	Growth-Phasing Systems for Public Facilities				-		-	-	-			-	-
		Development Caps and Rate Allocation Systems				-		-	-	-			-	
		Carrying Capacity Limitations				-		-	-	-			-	
		Moratoriums and Interim Development Regulations						-	-	-		-		-
Coordinating and Integrating Processes, Plans, and Functional Assignments	Plans	State Development Plans				-		-	-	-	-		-	-
		Comprehensive Plans		-		-	-	P	P	P	P		-	-
		Specific-Area Development Plans	-	-	-	-	-	-	P	P	-	-	-	P
		Strategic Policy Plans	-	-	-	-	-	-	-	-	-	-	-	-
	Processes	Streamlined Permit Processing						-	-		-			-
		Vertical Plan Consistency Requirements				-		-	-	-		-		-
		Horizontal Plan Consistency Requirements				-		-	-	-		-		-
		Cross-Acceptance Process				-		-	-	-	-	-		-
		Comprehensive Plan Consistency Requirements				-		-	-	-		-		-
		State Policy Assessment	-	-	-	-	-	-	-	-	-	-	-	-
	Functional Assignments	Regional Growth Management Hearing Board				-		-	-	-	-	-		-
		Regional Planning Councils				-		-	-	-	-	-		-
		Regional Service Provider / Standards				-		-	-	-	-	-		-

P: primary, S: secondary

APPENDIX D

Appendix D

Literature Review Bibliography on Transportation and Growth Management Effectiveness

Transportation-Related Strategies and Policy Actions

Transit-Oriented Development

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APPENDIX E

TXMPO Survey Questionnaire Results

Case #	Case 6	Case 7	Case 8	Case 9
Name/Agency	TX_	TX_	TX	TX-

Question 1: 3 most effective **transportation "<u>strategies</u>" to manage sprawl**?

Case 06

1. Pricing Strategies in Transit
2. Alternative Mode Support Strategies – Facility & System Improvements
3. Objective-Based Strategies – Service Provisions

Case 07

1. Transit Oriented Development
2. Transportation-Efficient Land Use Planning & Development Strategies
3. Roadway Investment Strategies

Case 08

1. In Brownsville…the policies of the City government are to encourage all types of growth….and impose the least amount of restrictions. Thus, there is little to report in terms of "strategies" that manage sprawl.

Case 09

1. Transportation-Efficient Land Use Planning and Development Strategies
2. Alternative Mode Strategies
3. N/A

Question 2: 5 most effective **transportation policy "<u>actions/tools</u>" to manage sprawl**?

Case 06

. 1. Transit Fare Adjustment
2. Park & Ride Lots
3. Vanpooling and Ridematching Services
4. Job Access and Reverse Commute Program

Case 07

. 1. Congestion Pricing: Area-Wide
2. Congestion Pricing by Automatic Vehicle Identificaiton
3. Distance Based Taxes
4. Neighborhood Conservation Programs
5. Corridor Preservation and Planning

Case 08

1. (see above Q1.)

Case 09

1. Funding Allocation Systems Tied to Growth Management Goals
2. Neighborhood Conservation Program
3. Main Street Program (Downtown Revitalization)
4. Rail-Based Transit-Oriented Development (TOD)
5. Traditional Neighborhood Development (TND)

Question 3: 3 most effective **growth management** "**strategies" to manage sprawl**?

Case 06

1. Facility Planning
2. Growth Limits/Controls
3. Zoning approaches

Case 07

1. Growth Limits/Controls
2. Targeted Tax Abatement
3. Urban Growth Boundaries

Case 08

1. (see above Q1.)

Case 09

1. Compact development
2. Zoning approaches
3. n/a

Question 4: 5 most effective **growth management policy "actions/tools" to manage sprawl**?

Case 06

1. Capital Improvement Program (CIP)
2. Moratoriums and Interim Development Regulations
3. Growth-phasing Systems for Public Facilities
4. Mixed Use Land Development
5. Planned Unit Development (PUD)

Case 07

1. Mixed-Use Land Development
2. Cost-Based Utility Fees
3. Minimum Density Zoning/Standards
4. Comprehensive Plan Consistency Requirements
5. Infill Development

Case 08

1. (see above Q1.)

Case 09

1. infill development
2. mixed-use land development
3. comprehensive plans
4. regional planning councils
5. n/a

Question 5: 3 largest barriers to DOT/MPO efforts to avoid/mitigate sprawling development patterns

Case 06

1. The MPO is dependent on its members to implement policies to reduce sprawl.
2. The MPO does not have sufficient funding to deal with land use. It must depend on members for provide this information or planning.

Case 07

1. Urban Area Boundaries previously included too many low density areas
2. lack of funding
3. too many small localities without overlapping responsibilities (too fragramented)

Case 08

1. The policies of the local governments encourage the least amount of govt. intervention/or restrictions. The policy is designed to promote low costs to developers./..thus lessening the cost of housing for the consumers

Case 09

1. Lack of land use regulatory authority
2. Lack of any tax authority
3. N/A

Question 6: 3 most important things that the <u>Federal Government</u> could do to <u>facilitate DOT/MPO efforts to avoid or mitigate sprawl?</u>

Case 06

1. Act as a clearing house for information
2. Provide funding for studying the problems of sprawl

Case 07

1. more transit funding
2. air quality mandates
3. comprehensive transportation planning requirements

Case 08

1. The federal govt. does little to influence the attitudes of the citizens in Texas about such matters.

Case 09

1. Mandate that gas tax dollars are spent in the municipality in which they are raised.
2. Limit rail investments to local jurisdictions that mandate TOD around rail.
3. End state allocation of federal funds and allocate them directly to MPO's

Question 7: 3 most important things that the <u>State Government</u> could do to <u>facilitate DOT/MPO efforts to avoid or mitigate sprawl?</u>

Case 06

1. Additional funding for MPOs.
2. Provide technical assistance
3. Formalize the relationship between the MPO staff and the Policy Committee.

Case 07

1. more transit funding
2. air quality mandates
3. statewide planning mandates (interlocal MPO cooperation requirements)

Case 08

1. Encourage Access Mgt. (provide funding to those localities that intervene on the land use side of the equation within the land use: transportation connection.)

Case 09

1. sub-allocate to MPO's for selection of projects
2. use state gas tax funds for rail
3. limit transportation enhancements to air quality

Question 8: <u>3 most successful examples of combining land use and transportation strategies to manage sprawl in the United States?</u>

Case 06

1. None

Case 07

1. Planned Unit Developments – Sun City, Arizona (use of golf carts all all transportation need prevalent.
2. urban growth boundaries – Radcliffe, NJ? No subdivisions allowed outside areas of established infrastructure
3. pedestrian-oriented developments – Seaside Village, CA

Case 09

1. Washington D.C.
2. Dallas-Fort Worth MPO
3. N/A

Question 9: 3 most successful efforts to manage sprawl in your <u>metropolitan region or state</u>?

Case 06

1. None

Case 07

1. bike path systems like found in Bryan-College Station
2. no new capital investments as growth occurs like in Austin (though I don't think it was by design)
3. can't think of a third – Texas is a poster child for urban sprawl generally

Case 09

1. Central Fort Worth
2. Uptown Dallas
3. DART and associated transit organizations

[i] courtesy of John Fregonese, Fregonese and Calthorpe Associates, July 2003, Portland`