Best Practices in Metropolitan Land Use and Transportation Planning

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Abstract

This chapter reviews 35 representative long-range transportation plans, prepared by metropolitan planning organizations, to identify and describe conventional practices and emerging best practices in metropolitan land use and transportation planning. Conventional and best practices are outlined for goals and objectives, performance measures, land use and transportation integration, scenario planning, smart growth, highway expansion, highway maintenance, transit expansion, bike and pedestrian improvements, travel demand management, funding shortfalls, public involvement, and other topics. The best practices are designed to achieve broad goals and objectives in the areas of congestion relief, air quality, traffic safety, climate change, energy security, and public health.
Introduction

Metropolitan planning organizations (MPOs) are transportation policy and decision-making organizations made up of representatives of local governments and transportation agencies. Congress created MPOs in the 1960s to ensure that existing and future expenditures for transportation projects and programs were based on a “continuing, cooperative and comprehensive” (3-C) planning process. Every urban area in the United States of more than 50,000 residents must have a designated MPO in order to qualify for Federal transportation funding.

An MPO’s most important responsibility is to make decisions about funding. As a guide to funding, MPOs are required to periodically develop long range transportation plans (also referred to as regional transportation plans or RTPs), with planning horizons of at least 20 years. These plans prioritize transportation projects that cumulatively cannot exceed identified revenues.

For this study, we reviewed 35 RTPs for qualitative information on goals, objectives, policies, strategies, priorities, and other elements that could be used to analyze conventional planning practices and identify best practices. Results of our qualitative review are summarized in this chapter. We reviewed a larger set of 100 RTPs for quantitative data on demographics and performance outcomes for base and horizon years, as well as planned investments by type between base and horizon years. Our goal was to assemble a complete enough database to support the modeling of plan performance in terms of investment mix, controlling for demographic and land use influences. Results of this quantitative analysis are presented in the next chapter.

Figure 1: MPO Planning Responsibilities (New York Metropolitan Transportation Council, 2010, pg. 2)
**Sample Selection**

RTPs are usually hundreds of pages and occasionally thousands of pages in length, often in multiple volumes with multiple appendices. For this reason, we sampled from the universe of RTPs rather than reviewing all of them. Even

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the review of 35 RTPs required many person weeks of effort.

While we sampled a wide range of urbanized areas, our sampling strategy favored large MPOs over small ones because an initial review suggested that they face bigger challenges and arrive at more innovative solutions. Our sampling strategy sought representation from all parts of the country, both for political and methodological reasons. We wanted to be sure our results could not be dismissed as atypical or biased toward one set of conditions or solutions over others. For the same reason, our sampling strategy sought representation from older, more compact regions as well as newer, more sprawling regions.

### Plan Investments

RTPs plan for billions of dollars in transportation investments over their 20 year-plus planning horizons. While expenditures are sometimes given in today’s dollars and other times (per current regulations) given in year of expenditure dollars, the amounts invested are always impressive (see Table 1). The smallest expenditure estimate is just over $1 billion for the tiny Chittenden County Metropolitan Planning Organization in Burlington, VT (2005; p. 33). The largest is almost a trillion dollars ($986 billion) for the New York Metropolitan Transportation Council’s RTP (2010; p. 12).

Some plans provide only project lists with estimated costs. Most offer some sort of summary by category of expenditure. We have made an effort (only somewhat successful) to obtain summaries for uniform expenditure categories from the MPOs themselves. Table 1 is as close as we could come.

What is apparent is the following:

- MPOs continue to devote significant revenues to highway (freeway and principal arterial) expansion, despite the induced travel and induced development that follow from these investments. However, there is tremendous variation across RTPs, from a low of about 5 percent to a high of about 65 percent of total funds spent on highway expansion.
- Most MPOs do not earmark funds for managed lanes (HOV and HOT lanes). Of those that do, roughly half of highway funding is being devoted to managed rather than general purpose lanes. This is true in Atlanta, San Diego, San Francisco, and Los Angeles (Atlanta Regional Commission, 2008, p. 55; San Diego Association of Governments, 2007, p. 4-17; Metropolitan Transportation Commission, 2009, p. 15; Southern California Association of Governments, 2008, p. 2).
- Most MPOs do not estimate expenditures for minor roads (minor arterials, collectors, and locals). Two exceptions are Denver and San Diego, both of which are putting about a quarter of regional resources into completing the minor street network (Denver Regional Council of Governments, 2009, p. 106; San Diego Association of Governments, 2007, p. 4-17).
- MPOs are uneven in their funding of highway preservation, maintenance, and operations. The lowest share of total funds is about 6 percent, the highest about 45 percent. It is not clear whether more is better, as it may simply reflect lack of preventative maintenance in the past which has finally caught up with the region.
- Most MPOs devote substantial revenues to transit. Transit receives at
least a third of total funds in most large regions, and more than half in a few.

- In contrast, most MPOs spend relatively little on bike and pedestrian facilities. The largest share of total funds is about 5 percent, considerably less than the mode shares of bicycling and walking combined. Many MPOs treat bike and pedestrian facilities as local rather than regional responsibilities.

- Likewise, MPOs spend only small percentages of total funds on transportation system management (TSM), intelligence transportation systems (ITS), and travel demand management (TDM), this despite the fact that these are declared to be cost-effective and priorities in many plans.

**Plan Performance**

Amazingly, RTPs do not always present basic data on the performance of the regional transportation system in the base and horizon years. For those that do, we see the following:

- Auto travel will increase substantially everywhere, contrary to what is needed to meet climate goals. Part of this increase is due to growth itself. However, it is also due to highway investment and urban sprawl. Take Indianapolis. “It is clear that the increase in the number of trips (17 percent) alone does not account for the overall increase in VMT (27 percent). The remainder of the increase in VMT is due to the expected growth in population and households in outlying areas.” (2009, p. 44).

- Even on a per capita basis, VMT is projected to increase in most regions, and substantially in highway oriented regions such as Cincinnati and Dallas-Ft. Worth (Ohio-Kentucky-Indiana Council of Governments, 2008; North Central Texas Council of Governments, 2009).

The only region that projects a significant decrease in VMT per capita is Portland, OR, and even its decrease from 23.3 to 20.6 vehicle miles per day is not enough to meet county or state climate goals (Portland Metro Regional Government, 2010).

- Congestion, no matter how it is measured, will increase significantly between base and horizon years. As the Raleigh and Durham RTPs state: “No region has been able to ‘build its way’ out of congestion” (Capital Region Metropolitan Planning Organization, 2009, p. 11-A). This statement is echoed in the RTPs of Cincinnati, Eugene, San Diego, Tucson, and others (Ohio-Kentucky-Indiana Council of Governments, 2008; San Diego Association of Governments, 2007; Pima Association of Governments, 2010).

**Figure 3: Interstate Improvement Plan** (Community Planning Association of Southwest Idaho, 2006, pg. 55)

- Congestion will increase not only in the aggregate but on a per capita basis. In all **nine** regions that provide delay figures, delay per capita is projected to increase, dramatically in some cases. In all **seven** regions that provide average travel speed, it is projected to decline,
dramatically in three regions. In all six regions that provide vehicle hours traveled (VHT), it is projected to increase faster than VMT.

- One bright spot in the performance picture is in the area of transit ridership. Whether in terms of transit trips per capita or transit mode share, transit ridership is projected to increase in all regions for which projections are available. The increases are dramatic in Boston, Denver, Honolulu, Sacramento, Salt Lake City, and San Francisco (Boston Region Metropolitan Planning Organization, 2007; Denver Regional Council of Governments, 2009; Oahu Metropolitan Planning Organization, 2006; Sacramento Area Council of Governments, 2008; Wasatch Front Regional Council, 2007; Metropolitan Transportation Commission, 2009).
- Another bright spot is in area of walking/bicycling. Four of six RTPs that provide such projections show walk/bike mode shares increasing between base and horizon years.
- Given these projected shifts to alternative modes, the fact that VMT per capita is increasing almost everywhere must mean that auto trips are getting longer. Auto trips must be getting longer because highway capacity improvements and urban sprawl make longer trips possible and necessary.

**Mission or Vision**

**Conventional Practice**

Most RTPs have no underlying mission or vision that guides the planning process. Instead, they are collections of generalized goals and grab bags of projects.

**Best Practice**

Certain plans are unified by philosophies that make sense in light of resource constraints and regional goals. One such philosophy-driven plan is the San Francisco Bay Area’s, which emphasizes compact development, pricing, and technology:
We learned that infrastructure investments produce only modest tangible effects at the regional level, and that aggressive pricing and land-use strategies exert much greater influence than transportation projects alone in moving us toward achievement of the performance objectives. We also learned that we must rely on technological innovations to make significant headway toward getting us within range of our goals (Metropolitan Transportation Commission, 2009, p. 12).

Another example is San Diego’s emphasis on smart growth, broadly defined:

... if we have learned anything in the last decade, it’s that we can’t build our way out of traffic congestion. This leaves us at a crossroads – the road less traveled may hold the key to how we commute in the future. In this era of budget and infrastructure deficits, the ultimate success of this Plan will be measured by how well we implement smart growth as our communities are developed and redeveloped over time. To this end, the 2030 RTP helps

strengthen the land use – transportation connection and offers regional transportation funding incentives to support smarter, more sustainable land use (San Diego Association of Governments, 2007, p. 1-1).

A final example is St. Louis’ emphasis on “fix it first” and operational improvements over capacity expansion:

The focus is no longer on building large projects to increase the capacity of roads and highways. Preserving and maintaining the transportation system is where most of the money is spent. From the 1950s through the mid-90s, the purpose of federal, state and to some degree local transportation investments was to build the infrastructure that was adequate and appropriate to keep the nation’s economy moving and to preserve the national defense. At the end of the 20th Century, the Interstate was complete. Most of the state, county and local roads needed to support mobility had been constructed. Some major projects remained on the region’s wish list, but the overall emphasis shifted from building new roadways to improving the condition, operation, safety and accessibility of the existing system. That will continue for the next 25 years. It may take a seismic shift in thinking to adapt an existing transportation system to the 21st Century when many of its component parts were built 10, 25 and 50 years ago (East-West Gateway Council of Governments, 2007, p. 7).

Goals and Objectives

Conventional Practice

Many RTPs focus on the traditional goal of the traffic engineering profession, traffic congestion relief. While they may also acknowledge SAFETEA-LU’s eight metropolitan planning factors, and often include some discussion of traffic safety, air quality, and environmental justice, there is no doubt where they place their emphasis. The RTPs contain entire chapters on congestion management.

To some degree MPOs are following precedent or habit, and to some extent they are conforming to federal regulations. SAFETEA-LU
requires larger MPOs to adopt a Congestion Management Process with which they monitor mobility within the region, obtain timely information about transportation system performance, and make recommendations to correct deficiencies that are found.

With the passage of SAFETEA-LU, all states are required to prepare Strategic Highway Safety Plans. SAFETEA-LU requires that RTPs include safety elements that incorporate or summarize the priorities, goals, countermeasures, and projects contained in their respective state Strategic Highway Safety Plans.

MPOs’ emphasis on air quality is a natural result of the conformity requirements of the Clean Air Act amendments. The recent sensitivity to environmental justice issues is a response to federal law and regulation. RTPs often devote entire chapters or entire appendices to these regulatory subjects. The Kansas City RTP, for example, has appendices on environmental justice (Appendix C), air quality conformity (Appendix D), and metropolitan planning factors (Appendix E) (Mid-America Regional Council, 2010). This implies that federal laws and regulations can shift the emphasis toward emerging goals of state or federal policy. The emphasis on congestion management, for example, may tilt the planning process toward capacity expansion, whereas emerging goals may have just the opposite effect, striving instead to minimize highway induced traffic and contain VMT (vehicle miles traveled).

**Best Practice**

The best practice is to adopt broad goals and make an effort to operationalize objectives through quantification. Three emerging goals appear in progressive plans. One is to promote active travel, in the interest of physical activity, obesity prevention, and public health. These plans give more emphasis than earlier plans to bicycle and pedestrian facility improvements. The San Diego plan contains the following discussion of active travel (and ample earmarking funding – 3.4% of the total – for bicycle and pedestrian improvements):

Researchers are finding that people are more physically active when they live in communities that are more compact and have a greater mix of land uses than those who live in single-use, lower-density neighborhoods. The key features of the communities that support a more active lifestyle appear to be an interconnected street network, higher-density housing, and a mix of land uses that put goods and services closer to home or work. In other words, people who live in walkable, bicycle-friendly communities are more likely to use walking and bicycling as everyday forms of transportation (San Diego Association of Governments, 2007, p. 5-18).

Another emerging goal is the mitigation of greenhouse gas emissions. This is different than the historical emphasis on regulated pollutants. Climate goals are less susceptible to improvements in vehicle technology, as CO2 emission cannot be captured at the tailpipe. The level of greenhouse gas emissions is far more dependent on the amount of driving and aggregate VMT.

As the fingerprints of climate change become undeniable, and pressure from other countries mounts, Congress will eventually pass climate legislation. When this occurs:

...it is highly likely the Commission will need to identify new GHG reduction goals, targets, milestones and reduction actions. While these new requirements are not yet known, the scientific evidence is overwhelming and need for
In part because its plan was adopted recently at a time of heightened concern about climate change, and in part because it is located in the leading state for climate action, the San Francisco RTP gives at least as much emphasis to climate mitigation as to the conventional goal of congestion relief.

Not only does its plan contain a whole section on climate (“Lead the Charge on Climate Protection”), but it establishes a new multimillion dollar Climate Grants Program to determine what strategies can most effectively reduce GHG emissions (Metropolitan Transportation Commission, 2009, p. 46).

Potential projects may seek to increase the use of low-GHG alternative fuels, expand car-sharing programs, implement low-GHG tire incentive programs, or price demonstration projects.

Our transportation decisions and actions can either help or hinder efforts to protect the climate, and to this end, the Commission has set aside $400 million to implement a Transportation Climate Action Campaign that focuses on individual actions, public-private partnerships, and incentives and grants for innovative climate strategies. Known for its commitment to the environment, the Bay Area is ideally suited to provide regional leadership and serve as a model for California, the nation and the world in our efforts to reduce our carbon footprint (Metropolitan Transportation Commission, 2009, p. 14).

The third emerging goal is energy security in the face of the peaking and subsequent decline of worldwide oil production within the time frame of long-range transportation plans. Researchers now are engaged in estimating when the phenomenon will occur at a global scale. Peak oil production (“peak oil”) occurred at the national level in countries around the world, with peaks in the lower 48 United States, Alaska, and Mexico occurring in 1971, 1989, 2004, respectively (Zittel and Schindler, 2007).

![Figure 6: Regulated Pollutant Emission on the Decline (unlike CO2 emissions) (Wasatch Front Regional Council, 2007, pg. 235)](image)

![Figure 7: Public Concern about Climate Change in the Bay Area (Metropolitan Transportation Commission, 2009, pg. 19)](image)
The U.S. Government Accountability Office (2007) puts the date sometime before 2040. Regardless of the peaking date, a constant factor running through the analyses is that oil prices will increase significantly; the only real debate is how fast (Haubrich and Meyer, 2007).

Future oil supply uncertainty is generally approached from either a security angle (“Energy Security”) or scarcity angle (“Peak Oil”). The “energy security” view focuses on the risk to U.S. interests posed by external forces, whether unfriendly governments or natural disasters, that may affect the supply and price of oil. The “peak oil” view focuses on a theorized imminent (within the next 30 years) decline of worldwide oil production. The views are not non-complementary, and both agree that we are entering a period of uncertainty in oil supply and price. Both views have been supported by established petroleum geologists, as well as by mainstream political figures (Portland Metro Regional Government, 2010, pp. 1-40).

Policies designed to mitigate climate impacts by reducing VMT will also increase energy security.

Over the coming decades, the profound transformation of the global economy to use less energy and produce less GHG presents a tremendous opportunity for Greater Philadelphia. As we transform our land use to build on our historic advantages of mixed-use development and transit infrastructure, we will also transform our business and workforce infrastructure to provide the products, services, and skills required for this future. This transformation will require regional cooperation and strong coordination between the states, counties, and municipalities. DVRPC continues to play a critical role in building and leading that coordination. As energy prices increase and governmental policies to curb GHG emissions are put in place across the nation and world, businesses and individuals will increasingly select places where they can meet their needs with less energy from fossil fuel sources. In order to keep the DVRPC region competitive, a multipronged strategy is needed to effectively address both GHG emissions and energy use (Delaware Valley Regional Planning Council, 2009, pg. 78).

Figure 8: Peak Oil (Capital Area Metropolitan Planning Organization of Austin, 2010, pg. 46)
Performance Measures

Conventional Practice

A common practice is to provide no outcome measures in RTPs, that is, no quantitative measures of plan performance. All RTPs provide information on inputs, specifically dollars to be spent, but most fail to quantify what is accomplished with all those billions of dollars.

If performance measures are provided, the focus is on congestion, and other performance outcomes are defined only in qualitative terms. The Atlanta RTP contains hundreds of qualitative objectives, but there is only one quantitative objective, and it relates to congestion.

The region’s TTI [travel time index—free flow travel time divided by free flow travel time] system-wide target is 1.35. A value of 1.35 is equivalent to traffic reaching approximately 67% of designed capacity. Generally, 67% of designed capacity equates to receiving a mobility grade of “C.” Rush hour traffic typically rises to level “E” or “F.” A grade of “F” is the worst possible grade and reflects gridlock conditions. A grade of “A” represents the most desirable traffic conditions (free flow). In order to capture a better understanding of where the worst congestion is, the CMP includes a second benchmark beyond the 1.35 target with a TTI value of 1.80. This value represents the type of congestion typically experienced during weekday afternoons and is equivalent to an “E” or “F” (Atlanta Regional Commission, 2008, p. 24).

Notwithstanding this emphasis on congestion relief, traffic conditions in Atlanta are projected to get dramatically worse.

At the same time, the Atlanta plan contains no objective and no performance information related to VMT, this despite the fact that VMT is strongly related to impacts of the plan such as greenhouse gas emissions.

Figure 9: Regional Travel Time Index, 2005-2030 (Atlanta Regional Commission, 2008, pg. 78)
Best Practice

“If you haven’t decided on a destination, how will you know when you get there?” “What gets measured gets done.” These and other old saws argue for a balanced scorecard of quantitative performance objectives and outcome measures. The Portland RTP contains such a scorecard:

- **Safety** – By 2035, reduce crashes, injuries and fatalities by 50 percent compared to 2005.
- **Congestion** – By 2035, reduce vehicle hours of delay per person by 10 percent compared to 2005.
- **Climate change** – By 2035, reduce carbon dioxide emissions by 40 percent below 1990 levels.
- **Active transportation** – By 2035, triple walking, biking and transit trips compared to 2005.
- **Clean air** – By 2035, ensure zero percent population exposure to at-risk levels of air pollution.
- **Travel** – By 2035, reduce vehicle miles traveled per person by 10 percent compared to 2005.
- **Affordability** – By 2035, reduce the average household combined cost of housing and transportation by 25 percent compared to 2000.
- **Access to daily needs** – By 2035, increase by 50 percent the number of essential destinations accessible within 30 minutes by bicycling and public transit for low-income, minority, senior and disabled populations compared to 2005 (Portland Metro Regional Government, 2010, p. 2-13).

Demographics

Conventional Practice

Most RTPs contain population and employment forecasts, and many include forecasts for age cohorts. Those that do all reach the same conclusion: that the most significant demographic shift from the base to the horizon year will be the aging of the population, as in Atlanta.

In terms of size, the growth of the next few decades is similar to the growth of the previous decades. But the type of growth will be different — the 20-county area is growing older. While those age 59 and younger will decline in total share of population, the 60+ age group will double its share from about 11 percent today to slightly more than 21 percent by 2030 (Atlanta Regional Commission, 2008, p. 16).

Figure 10: Changing Age Distribution (Atlanta Regional Commission, 2008, pg. 17)
While acknowledging the trend, few RTPs fully explore the implications for housing choices and travel needs. Typical is this status quo modal assessment from the Cincinnati RTP:

While the proportion of the population in their retirement years will be increasing during the planning period, the proportion of this age group that drives will increase even faster. As today’s population ages, the elderly of the future will be almost universally licensed to drive, accustomed to driving on a nearly daily basis and concentrated in suburban areas that are auto-dependent. The elderly will continue to drive as long as they are physically or legally able (Ohio-Kentucky-Indiana Regional Council of Governments, 2008, p. 4-5).

Typical of the housing market analyses is this status quo assessment from the Philadelphia RTP:

Many aging suburban baby boomers will want to stay in the suburban communities in which they have raised their families after they retire. Challenges facing seniors include a lack of affordable and accessible housing alternatives; limited accessibility within their existing homes; limited accessibility within their communities; and difficulties with transportation and mobility, especially given the lack of public transit in many suburban locations. Elderly homeowners will also face economic challenges, as the cost of essentials such as transportation and health care skyrocket, leaving less money available for housing costs (including rising property taxes and the costs of home repair and maintenance). It is imperative that the region’s elected officials, planners, service providers, and the elderly and near-elderly themselves plan now to accommodate the coming “senior boom” (Delaware Valley Regional Planning Commission, 2009, p. 19).

The response to demographic change is usually reactive rather than proactive, in keeping with the notion that MPOs have no control over land use patterns.

Starting in 2010, baby boomers will start turning 65. By 2035, over half a million people in the region will reach retirement age and many of them will leave the workforce. The expected jobs/labor force imbalance will increase the distance people will travel for work, as well as produce longer commute times and more congested roadways (Baltimore Regional Transportation Board, 2007, p. 86).

**Best Practice**

The best practice would not only acknowledge this revolutionary change in the age distribution, but would fully explore the implications for land use and transportation planning. Among the implications are a slowdown in the growth of VMT, a growing demand for community-level transit, and a growing demand for housing in dense, walkable activity centers. Certain RTPs deal with these realities in qualitative terms, but few quantify and plan for the effects.

From the San Francisco RTP comes this qualitative assessment of change travel and housing demands:

Key among the demographic changes that will affect Bay Area transportation is the aging of the Baby Boomers. As this sizeable segment of the region’s residents reaches senior status, it is expected that many will relocate into smaller dwellings in the more urban portions of the Bay Area to have easier access to essential services and cultural
opportunities. For some, with aging will come a loss of the ability to drive, and for those with low incomes or physical disabilities, lifeline” transportation issues will become increasingly important. From a land use and mobility perspective, then, the graying of the Baby Boomers would seem to argue for a greater emphasis on smaller homes, low maintenance housing arrangements, and a heavier reliance on non-driving transportation options, such as transit and ride-sharing with younger friends and family (Metropolitan Transportation Council, 2009, p. 8).

Probably the main implication of this demographic shift is the need for smart growth initiatives like those described below, fostering dense, mixed use centers where seniors can age comfortably in place.

**Scenario Planning**

**Conventional Practice**

The conventional practice is to test future alternative transportation investments against a fixed future land use forecast, to see how well the former meet the travel demands generated by the latter. In starting its scenario planning process, the Boise MPO noted:

...past plans started with a single view of future growth and became a process of asking participants what transportation projects they wanted. The resulting lists were assembled into a plan (Community Planning Association of Southwest Idaho, 2006, p. 26).

In conventional practice, future land use patterns are taken as a given that cannot be modified by an MPO or its constituent governments. This is what was done in Cincinnati, where future land use patterns are assumed to be even more sprawling than present day’s (see Figure 10).

**Best Practice**

An alternative approach, exemplified by RTPs of Boise, Boston, Dallas-Ft. Worth, Lansing, Portland, Sacramento, Salt Lake City, San Diego, and other leading regions, assumes that future development patterns can take various forms, just as future transportation investments can take various forms (Community Planning Association of Southwest Idaho, 2006; Boston Region Metropolitan Planning Organization, 2007; North Central Texas Council of Governments, 2009; Portland Metro Regional Government, 2010; Sacramento Area Council of Governments, 2008; Wasatch Front Regional Council, 2007; San Diego Association of Governments, 2007).

These various forms are run through the regional travel demand model to see how well they perform with respect to VMT, congestion, and other transportation outcomes.

*Figure 11: Household Change, 2005-2030 (OKI Regional Council of Governments, 2008, pg. 4-4)*
The main conclusion from these scenario plan studies is that transportation outcomes depend as much on development patterns as they do on transportation system improvements. In the Burlington RTP:

...the single most important factor to improving transportation system performance is to move toward a land use pattern based on concentrated development similar to that identified in the CCRPC Regional Plan. In fact, the success of the future transportation system investments outlined in the Preferred Alternative above is dependent upon achieving [this] development pattern (Chittenden County Metropolitan Planning Organization, 2005, pg. 59).

Likewise, in the Lansing RTP:

TCRPC’s primary strategy to address congestion throughout the region is land use based. The primary element of this land use strategy is implementing the adopted “Wise Growth” scenario, the regional land use vision developed through the “Regional Growth: Choices for Our Future” project. As noted, implementing this strategy reduces congested lane miles to nearly half of what would otherwise occur at regional build out under densities permitted by current zoning. (Tri-County Regional Planning Commission, 2010, p. 8-8).

Inherent in scenario planning studies is the belief that future development patterns can be influenced by the MPO, through its investments and the leverage it exercises over local governments.

The use of scenario planning for positive ends is illustrated in Sacramento. Sacramento’s previous RTP had come up short in a number of respects:

...the focus on these indicators began with the adoption of the Metropolitan Transportation Plan for 2025 (MTP2025) in July 2002. Although adopted unanimously by the SACOG Board, the Board was extremely concerned about several worrisome projections presented in that plan:

- VMT growth continuing to outstrip population growth. The plan was based on a projected population growth of 49 percent between 2000 and 2025, but VMT was projected to grow by about 65 percent over the same period. This meant that the average household needed to drive 8 percent more vehicle miles in order to live, work and play in the Sacramento region. Given the air quality problems in the region, and the strong relationship between vehicle emissions and VMT, this trend was a great concern.
- Roadway congestion growth far in excess of growth in VMT. Even with all of the investments in the MTP2025, roadway congestion experienced by the average household was expected to increase by 58 percent. Total region-wide VMT on heavily congested roadways was expected to increase by 230 percent.
- Transit ridership increases, but not by much. The region-wide transit mode share was projected to increase from 1.0 to 1.2 percent of all trips, even with a large increase in transit service.
- Loss in non-motorized mode share. The percentage of trips made by bike and walk modes was projected to decrease from 6.9 percent to 6.6 percent (Sacramento Area Regional Council of Governments, 2008, p. 45).
Disenchantment with the earlier RTP led to a scenario planning process, and the adoption of a Preferred Scenario based on seven smart growth principles, that outperformed the earlier plan in all respects including a 26 percent reduction in regional VMT.

**Land Use-Transportation Integration**

**Conventional Practice**

MPOs have historically embraced a hands-off policy when it comes to land use planning, even while acknowledging the critical links between land use and transportation. As the Raleigh and Durham RTPs put it:

Land use in the Triangle is the responsibility of each local government, not the MPOs. But few things influence the functionality and effectiveness of our transportation system as much as the locations, types, intensities and designs of new developments in our region. If we are to successfully provide for the mobility needs of the 1.6 million people here today and the additional million that will be added over the timeframe of this plan, we will need to do a top-notch job of matching our land use decisions with our transportation investments (Capital Area Metropolitan Planning Organization and Durham-Chapel Hill-Carrboro Metropolitan Planning Organization, 2009, p. 52).

Land use and transportation coordination is often treated as a one-way relationship. Land use plans are adopted by local jurisdictions, and the MPO then must then find a way to accommodate resulting future travel demands:

While land use planning is not within the purview of regional transportation planning, approaches to linking land use and transportation are underway... Land use planning and zoning decisions are made at the local jurisdiction level, which are then reflected in the forecasts developed for population, households and employment. This information forms the basis for recommended transportation
investments (Baltimore Regional Transportation Board, 2007, pp. 59-60).

The Colorado Springs MPO ranked three transportation system scenarios in the following order:
1) Reduced Environmental Impacts System
2) Balanced Investment System
3) Strategic Corridors System

Although the Reduced Environmental Impacts scenario had the highest score, it would have required local governments to change their adopted land-use plans to increase density along rapid transit corridors. Advisory committees therefore recommended and the MPO adopted the less preferred alternative because it would not require any changes in local land use plans.

Pursuing a future development ‘scenario’ that increases density for improved transit requires that municipal and regional governments are willing and able to pursue development policies that capitalize on the value brought about by fixed transit infrastructure (Pike’s Peak Area Council of Governments, 2008, p. 49).

The MPO and its advisory committees were not willing to make this leap of faith.

Best Practice

RTPs routinely call for the integration and coordination of land use and transportation, as in the Honolulu RTP:

Land Use and Transportation Integration System Goal: Develop and maintain Oahu’s transportation system in a manner that integrates land uses and Transportation (Oahu Metropolitan Planning Organization, 2006, p. 5).

But what does integration mean, and how can it be achieved? MPOs can use the power of the purse to affect land use decisions. The Boston MPO is one of several that do so:

The MPO considers land use and economic development in its project-prioritization and funding processes so that transportation spending will respond both to current conditions and to future needs likely to result from local and regional plans and priorities. The selection process for projects in JOURNEY to 2030 included consideration of land use and economic development factors. Those factors are also included in the criteria the MPO uses to select projects for funding in its Transportation Improvement Program (TIP) (Boston Region Metropolitan Planning Organization, 2007, p. 11-3).

What local decisions can and should MPOs seek to influence? The Raleigh and Durham RTPs provide a partial list:

The ties between regional transportation interests and local land use decisions are most pronounced in three cases:
1. Transit Station Area Development.

While most would agree that the ties between land use and transportation transcend these three areas, these are good examples of areas in which MPOs can (though seldom do) take a leadership role.
The Metropolitan Transportation Commission in San Francisco may be the best example of an MPO that has successfully promoted TOD. Resolution 3434 establishes minimum levels of development around transit stations along new transit corridors.

... the Commission’s 2005 adoption of the Resolution 3434 Transit-Oriented Development (TOD) Policy helps to maximize the effectiveness and value of regional services by conditioning discretionary funds on transit-supportive land uses. In fact, the TOD policy will help stimulate the construction of at least 42,000 new housing units and boost the region’s overall transit ridership by over 50 percent by 2035 (Metropolitan Transportation Commission, 2009, p.17).

Probably the best example of an MPO promoting access management is in Reno. The Access Management Standards shown in (the accompanying table) will be used in the design of future improvements to the Regional Road System (RRS) and the classification of existing improvements for planning purposes (Regional Transportation Commission of Washoe County, 2008, p. 2-4).

The best example of an MPO that has weighed in on complete streets and context-sensitive design is in Portland. Portland Metro has published three handbooks related to street design. Creating Livable Streets: Street Design Guidelines for 2040 provides model street designs that successfully integrate streets with nearby land uses to enhance safety and promote community livability (Portland Metro Regional Government, 2004). The guidelines have provided the impetus for reform of street standards by the region’s localities.
Urban Form

Conventional Practice

Just as the emphasis in transportation plans is on roadway congestion, so is the emphasis in associated land use plans on one aspect of urban form, density. From the St. Louis RTP:

The dispersed development patterns that have emerged over the last 50 years have fundamentally changed the way people travel. According to the Census Bureau, between 2000 and 2005, regional density decreased by over 21 percent. The dispersion of activities made possible by the automobile has made it an almost absolute necessity to meet their daily needs and actively participate in the community (East-West Gateway Council of Governments, 2007, p. 59).
Recent travel demand modeling results for the Boston region suggest that changes in land use that create denser future developments located near existing transportation facilities will have a more positive impact on reducing congestion, increasing mobility, and improving air quality than all the new transportation projects the region can afford to build in the next 23 years (Boston Region Metropolitan Planning Organization, 2007, p. 11-2).

While density is important, it appears to be the least important of D variables from a travel standpoint. The original “three Ds,” coined by Cervero and Kockelman (1997), are density, diversity, and design. Additional Ds have been labeled since then, destination accessibility and distance to transit (Ewing and Cervero 2001). A recent meta-analysis of the vast literature on the built environment and travel suggests that elasticities of VMT, walking, and transit use are greatest for destination accessibility and smallest for density (Ewing and Cervero 2010).
Best Practice

Destination accessibility can be achieved by channeling growth into population and employment centers. MPOs that do not plan for centered development will experience growth of VMT per capita (and more so, growth of aggregate VMT).

Under the 2031 Financially Constrained RTP, VMT per capita increases slightly. The TPR (Oregon’s Transportation Planning Rule) seeks no increase in VMT per capita over ten years and a 5 percent reduction over 20 years. Reasons for not meeting this VMT reduction target include a high proportion of growth in the outlying parts of the study area, and few and small contiguous areas of higher density. Growth in outlying parts of the study area has the effect of increasing average trip lengths in these areas. Limited areas of higher density limits the effectiveness of transit and alternative mode strategies. The region’s model estimates that trips to and from these growth areas are 21 percent longer than the regional average trip length (Central Lane Metropolitan Planning Organization, 2007, Chapter 4, p. 6).

Many MPOs now have center-based future land use plans for their regions. They seek to channel growth into these centers by channeling transportation investments into these centers, and providing discretionary funding to localities that accept and cultivate dense, mixed use centers with interconnected streets (see section on Smart Growth).

Among the regions with center-based plans are: Austin, Denver, Eugene, Minneapolis-St. Paul, Portland, Salt Lake City, and Seattle (Capital Area Metropolitan Planning Organization of Austin, 2009; Denver Regional Council of Governments, 2009; Central Lane Metropolitan Planning Organization, 2007; Minneapolis-St. Paul Metropolitan Council, 2009; Portland Metro Regional Government, 2010; Wasatch Front Regional Council, 2007; Puget Sound Regional Council, 2010). The Austin RTP notes:

Historically, CAMPO has developed long-range transportation plans based on past growth trends. We have taken a different approach for the current plan. This plan has been developed with the assumption that we may no longer be able to afford to invest in major regional infrastructure as we have in the past....The CAMPO 2035 Plan assumes that the region will work toward implementation of a network of high density mixed use centers oriented around the transportation investments included in the CAMPO 2035 Plan (Capital Area Metropolitan Planning Organization of Austin, 2009, p. 17).

The Austin MPO is supporting the emergence of mixed use activity centers throughout the region by setting aside funding for transportation projects serving centers identified on the CAMPO Centers Map.

Figure 17: Population and Employment Targets for Regional Centers (Capital Area Metropolitan Planning Organization of Austin, 2009, pg. 20)
Likewise, in Seattle:

A key element of this urban growth strategy is the development of “urban centers” within the urban growth area. Centers are places that contain a mix of business, commercial, residential, and cultural activity within a compact area. Centers are places where walking and transit use, as well as automobile and bicycle access, are viable transportation options (Puget Sound Regional Council, 2007, p. 17).

A few plans (very few) also emphasize land use diversity (for example, jobs-housing balance) and pedestrian-friendly design (for example, local street connectivity).

**Figure 18: Center-Based Land Use Plan (Puget Sound Regional Council, 2007, pg. 8)**

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**Smart Growth Implementation**

**Conventional Practice**

The conventional practice is for MPOs to assume that development patterns are the exclusive purview of the development industry and local governments exercising zoning powers. This is changing, as indicated in the Boston RTP:

It is important to coordinate transportation planning decisions and land use planning decisions so they are complementary, not contradictory. This is difficult, since transportation funding decisions are made at the regional and state levels, and land use decisions are primarily made by municipalities.

However, extended public discussion on the relationship between land use, transportation, and economic development has clarified their links and has guided state, regional, and much local project-based decision-making in the direction of considering all three elements (Boston Region Metropolitan Planning Organization, 2007, p. 11-2).

The practice is changing because the performance of RTPs depends as much on development patterns as on infrastructure investments. The Seattle RTP notes:

While considerable attention is traditionally given to multi-modal infrastructure and transportation services investments, less attention is directed at regional development patterns and system management practices, such as the pricing of transportation and technological management systems, as a means to influence travel and reduce overall...
personal and public costs of regional transportation. Within the next 30 years, the region can meet its travel needs in a far more effective and cost efficient manner than it has during the past 30 years (Puget Sound Regional Council, 2007, p. 16).

Best Practice

Smart growth is now called for in many RTPs, reflecting state and local efforts to discourage sprawl. The Boston RTP characterizes smart growth this way:

“Smart growth” is a statewide policy that has been particularly influential recently in guiding thinking relative to integrated transportation/land use decision-making in the Boston Region MPO area. It is a land use development principle that is commonly understood as encouraging compact, mixed-use development that enhances the built environment of a community and that, among other outcomes, minimizes environmental impacts, supports air quality, and promotes energy efficiency and economic activity. Smart growth takes maximum advantage of existing transportation and community infrastructure such as transit, water, and sewer facilities; it encourages efficiencies in public and private investments by building in accessibility to this infrastructure. It helps focus housing and economic development in areas where these land uses can be supported with minimized negative impact. In addition, consideration of freight distribution needs can reduce impacts on communities and travel distances. Transit, bicycle, and pedestrian modes become more viable (Boston Region Metropolitan Planning Organization, 2007, p. 11-4). MPOs conducting scenario planning exercises always include one or more smart growth alternatives (though not necessarily by name) among the plans tested. They end up adopting some variant as the official land use plan for the region.

The benefits of smart growth show up clearly in projected performance of the smart growth plan versus the trend or no-build alternatives. Take the example of San Diego:

In this era of budget and infrastructure deficits, the ultimate success of this Plan will be measured by how well we implement smart growth as our communities are developed and redeveloped over time. To this end, the 2030 RTP helps strengthen the land use – transportation connection and offers regional transportation funding incentives to support smarter, more sustainable land use. Compared to the No Build scenario, the Plan produces dramatic decreases in freeway congestion (a measure of Reliability), lowering it from 54 percent in No Build to 30 percent. In the Smart Growth alternative, congestion would be even lower than 2006 figures, and at 26 percent, is another 4 percent lower than the Plan in the peak period (San Diego Association of Governments, 2007, p. 1-1).

What differs from region to region is not so much the desire for smart growth or the projected benefits, but the degree to which it is actively encouraged in the RTP.

Some MPOs seek voluntary compliance by local governments with smart growth plans, using fiscal and other analyses to show that smart growth is more beneficial than sprawl. The Lansing MPO’s “wise growth” plan is backed by such analyses. To date 44 governing bodies covering 80 percent of the region’s population have adopted the future land use policy map and themes and principles, mostly by resolutions directing their staffs, consultants, and planning commissioners to implement that map and principles. Actions by other local governments and agencies are still pending.
Still other MPOs have become even more proactive in incentivizing smart growth—by setting aside a portion of funds for local governments that will accept and encourage smart growth. This has emerged as a best practice. Because of its critical importance to VMT reduction, we describe the approaches used in three different regions.

**San Francisco Bay.** Under a program called FOCUS, 60 local governments in the San Francisco Bay region have designated Priority Development Areas (PDAs) within their jurisdictions. A PDA is locally designated land where future growth can be channeled, at sufficient densities to take advantage of existing infrastructure and services, especially transit service (Metropolitan Transportation Commission, 2009, p. 8).

The current inventory of adopted PDAs (planned and potential) includes nearly 120 individual areas across the region. Together they comprise only about 3 percent of the region’s land area, but based on estimates provided by local governments, they could accommodate as much as 56 percent of the Bay Area’s growth to the year 2035 — all in locations that will be accessible to high-quality transit. “The early interest in this program is a hopeful sign for the region... FOCUS Priority Development Areas (PDAs), in particular, serve as a mechanism to gain local government buy-in to pursue focused growth near transit nodes in their communities” (Metropolitan Transportation Council, 2009, ps. 8,16).

FOCUS provides funding support via incentives such as capital infrastructure funds, planning grants and technical assistance to these communities because they will bear the lion’s share of the region’s future growth. In this Transportation 2035 Plan, MTC doubles the size of its Transportation for Livable Communities program, to $2.2 billion over the next 25 years, in order to advance focused growth objectives and support PDAs. This, plus the $400 million set aside for the Transportation Climate Action Campaign, represent 1.19 percent of Bay Area’s transportation revenues through 2035 (Metropolitan Transportation Council, 2009, ps. 46,72).

The MPO estimates that people living in focused, compact neighborhoods of the type envisioned for PDAs travel 20 to 40 percent fewer vehicle miles each day than those who live in the sprawling suburban tracts that typify the Bay Area’s post-World War II development pattern. This translates into a directly proportionate reduction in carbon dioxide emissions from personal travel (Metropolitan Transportation Council, 2009, ps. 74).

**San Diego.** Under San Diego’s 2005 Smart Growth Incentive pilot program, the MPO doled out $22.5 million in grants for local, smart growth development projects (San Diego
Association of Governments, 2007, p. 1-4). Funding was from the federal Transportation Enhancements program. The success of the pilot program led to the creation of a $206 million Smart Growth Incentive Program funded by a half cent local sales tax (San Diego Association of Governments, 2007, p. 1-4). This is 2 percent of the revenues generated by the sales tax and 0.36 percent of the MPO’s total revenues available through 2030 (San Diego Association of Governments, 2007, p. 5-26).

To be eligible for these funds, and receive priority for other funding, local governments designated almost 200 existing, planned, or potential “smart growth areas” to which dense mixed use development is being directed (San Diego Association of Governments, 2007, p. F-5). The areas fall into seven categories: Downtown San Diego, Urban Centers, Town Centers, Community Centers, Rural Villages, Mixed Use Transit Corridors, and Special Use Centers. These areas are shown on the accompanying Smart Growth Concept Map. They currently house 22% of the region’s population and are projected to house 29% by the year 2030.

The RCP establishes land use density and transportation service targets for each of the place types. If the areas on the map meet the targets in current land use and transportation plans, they are identified as “existing/planned” areas and eligible for infrastructure. If they do not, but they exhibit future opportunities for smart growth development, they are identified as “potential” areas eligible for planning grants only (San Diego Association of Governments, 2007, p. 5-4). Infrastructure grants can cover streetscape or sidewalk enhancements, transit station improvements, traffic calming measures, or other quality of life amenities that support smart growth in that area. Planning grants can be used to amend general plans, prepare specific plans, or update zoning ordinances that will provide the institutional framework for smart growth development in these areas. Every single jurisdiction in the San Diego region was able to identify at least one smart growth area on the map, demonstrating regionwide support for the smart growth principles included in the regional comprehensive plan (San Diego Association of Governments, 2007, p. 5-4).

The smart growth area designations have been incorporated into the RTP Transportation Project Evaluation Criteria used to prioritize funding for regional transportation projects (San Diego Association of Governments, 2007, p. 5-3). The map guides the planning and development of the region’s future transit networks, providing higher priority for peak period transit services that link smart growth areas to one another and to other major activity centers (San Diego Association of Governments, 2007, p. 5-16).

Figure 21: Smart Growth Concept Map (San Diego Association of Governments, 2007, pg. 5-5)
Dallas-Ft. Worth. Lest these examples be dismissed because they come from that outlier, California, the Dallas-Ft. Worth MPO has issued two Sustainable Development Calls for Projects. To be eligible, projects have to be located in “Sustainable Development Areas of Interest,” that is, within walking distance of current or potential future rail station locations; in areas with a concentration of unemployed persons, high emitting vehicles, or low income households; and/or in historic downtowns with multiple contiguous street block frontage of pedestrian-oriented development. Eligible projects were also required to have zoning in place that allowed the project to be built by right (North Central Texas Council of Governments, 2009, p. 60).

Under this program, $40.16 million in RTP funds are available for infrastructure, land banking, and planning projects. One hundred and thirty-six applications were received, requesting a total of $289 million, seven times that amount of money available. Funding was awarded to 40 projects in three categories: 28 infrastructure projects, 8 planning projects, and 4 land banking projects. Funding was also programmed for NCTCOG planning assistance to 52 transit-oriented development projects (North Central Texas Council of Governments, 2009, p. 63). Projects were determined eligible and scored based on the following criteria: access to transit, access to jobs, access to housing, provision of workforce housing, provision of jobs in areas of high unemployment, the match between employment and household income, pedestrian connectivity, and overall high unemployment rates (North Central Texas Council of Governments, 2009, p. 61).

Beyond earmarking funds for projects in smart growth areas, MPOs can encourage smart growth by providing technical assistance to localities that may not have the necessary expertise in-house. The most ambitious program to our knowledge is that of the Los Angeles MPO’s Compass Blueprint Program. The MPO’s consulting services are available to all local governments in the region, free of charge. Services have been sought for over 50 sites across the region.

Demonstration Projects range from parcel-specific zoning analyses to countywide plans around transit stations, and include an array of services including tipping point and business functionality analyses, design charrettes and community workshops, housing prototypes and conceptual land use plans, parking studies, and transit-oriented development strategies. With an ever-growing portfolio of completed, documented Demonstration Projects, an expanding Suite of Services, and significant improvements to existing tools, implementation efforts have seen sustained improvement since the Growth Vision was adopted (Southern California Association of Governments, 2008, p. 91).

Figure 22: Sustainable Development Focus Areas in Red (North Central Texas Council of Governments, 2009, pg. 61)
Major Highway Expansion

Conventional Practice

The conventional practice is to expand highway capacity through general purpose lane additions. Such expansion induces additional traffic and urban sprawl. If pricing is applied, it is in the form of general tolls that do not vary by time of day or congestion level. If lanes are reserved for high occupancy vehicles, the lanes are untolled and hence do not generate needed revenues. An example is the set of highway improvements that make up the Chicago RTP (Chicago Metropolitan Agency for Planning, 2008). There are sprawl inducing general lane additions such as those on I-55 and I-57 in the southern exurbs (see figure). There are toll road expansions such as those on I-88 and I-90 in the western exurbs (see figure). And there is a conventional (untolled) HOV expansion on I-290 (see figures 22-24).
Best Practice

Federal law and regulation already strive to discourage general purpose highway expansion in ozone and carbon monoxide nonattainment areas, acknowledging the induced traffic generated by such expansion:

(e) In TMAs designated as nonattainment for ozone or carbon monoxide, the congestion management process shall provide an appropriate analysis of reasonable (including multimodal) travel demand reduction and operational management strategies for the corridor in which a project that will result in a significant increase in capacity for SOVs (single-occupant vehicles) is proposed to be advanced with Federal funds. If the analysis demonstrates that travel demand reduction and operational management strategies cannot fully satisfy the need for additional capacity in the corridor and additional SOV capacity is warranted, then the congestion management process shall identify all reasonable strategies to manage the SOV facility safely and effectively (or to facilitate its management in the future). Other travel demand reduction and operational management strategies appropriate for the corridor, but not appropriate for incorporation into the SOV facility itself, shall also be identified through the congestion management process. All identified reasonable travel demand reduction and operational management strategies shall be incorporated into the SOV project or committed to by the State and MPO for implementation (23 CFR 450.320(e)).

The emerging best practice is to link highway expansion to congestion pricing and HOV promotion. Although commonly employed by airlines, utility companies and others, using price to avoid peak-period overload is the exception in surface transportation policy. As demonstrated by successful implementation in several U.S. cities, high-occupancy toll (HOT) lanes — which allow non-carpool drivers to pay a toll to access underutilized carpool lanes — can bring real benefits to travelers. HOT lanes, often called express lanes, provide travel options for carpools, express buses and toll payers; they allow for more efficient use of freeway capacity; and they generate revenues for other highway and transit improvements.

Figure 26: Support for HOT Lanes in the Bay Area (Metropolitan Transportation Commission, 2009, pg. 19)
Express lanes have been in operation for more than a decade in Houston, Los Angeles, and San Diego, and in the past five years have opened in Denver, Miami, Minneapolis, Salt Lake City, and Seattle (Houston-Galveston Area Council, 2007; San Diego Association of Governments, 2007; Denver Regional Council of Governments, 2009; Miami-Dade Metropolitan Planning Organization, 2009; Minneapolis-St. Paul Metropolitan Council, 2009; Wasatch Front Regional Council, 2007; Puget Sound Regional Council, 2007). Other regions are considering installation of express lanes. “An integrated system of Express Toll Lanes could help ease the impact of traffic congestion on Marylanders’ lives and do so decades sooner than traditional approaches would allow” (Baltimore Regional Transportation Board, 2007, p. 151).

Surveys show most travelers use express lanes to bypass congestion when they are late to pick up a child at daycare, to squeeze more working hours out of a day, or to catch a plane. For this reason, and because revenue from express lanes often supports public transit service enhancements, express lanes are widely supported by travelers at all income levels (Metropolitan Transportation Commission, 2009, p. 19).

Figure 27: Existing and Planned Managed Lane Facilities (Minneapolis-St. Paul Metropolitan Council, 2009, pg. 118)
Minor Street Expansion

Conventional Practice

The conventional practice is to focus attention and funding on freeways and principal arterials. If they are projected to operate below some acceptable level of service, then the RTP includes road widening or operational improvements among the funded projects. Typical of this emphasis are the following:

Completing the Regional Arterial System is a priority in the 2030 RTP. The regional arterials provide critical links to the highway network and serve as alternative routes to the highways themselves (San Diego Association of Governments, 2007, p. 6-30).

Roadway capacity expansion projects include over 1,500 new miles of highway and regional arterial lanes to address the region’s worst choke points, complete projects that have been started, and anticipate future problems. This represents a 13 percent increase in regional arterial and state freeway system lane miles (Puget Sound Regional Council, 2007, p. ii).

The 2030 RTP includes new or widened arterial streets and freeway improvements identified as needed to serve the existing and developing areas of the Wasatch Front Region. Approximately 1,070 lane miles of capacity improvements are planned for the next 23 years (Wasatch Front Regional Council, 2007, p. 148).

The problem with this focus is twofold. First, it ignores the important role played by lesser roadways in the functional hierarchy, those roads that are classified as minor arterials, collectors, or local streets. The literature suggests that a more complete local street network can actually reduce VMT by shortening travel distances (Ewing and Cervero, 2010).

Another problem with the focus on freeways and principal arterials is the incontrovertible fact that improvements to these higher level facilities induce additional VMT. This is apparent from the literature generally as well as recent quantitative analyses (Cervero, 2003; Ewing et al., 2008).

Best Practice

Depending on how complete the network is, minor arterials, collectors, and local streets can either relieve some of the pressure on arterials, or add to that pressure. Also, depending on the network, minor streets can make walking and cycling either attractive or nearly impossible. A few RTPs acknowledge the importance of having a dense network of interconnected minor streets:

The curvilinear cul-de-sac street pattern typical of recent subdivision design in the OKI region usually has very long blocks and many dead end streets. This pattern offers few route options since all traffic is typically funneled out onto a small number of arterial roads which can cause congestion. Connectivity involves a system of streets providing multiple routes and connections to the same origins and destinations. Improving street connectivity by providing parallel routes and cross connections, and a small number of closed end streets can reduce traffic on arterial streets and reduce travel time (OKI Regional Council of Governments, 2008, p. 3-10).
A better-connected network of neighborhood streets will help relieve traffic growth along heavily used corridors, and reduce congestion at major choke points and intersections. These streets will also provide for many safety improvements to the overall transportation network, allowing people to access nearby destinations on smaller-scaled, walkable, bikeable, and transit-friendly roadways (Charlottesville Albemarle Metropolitan Planning Organization, 2004, p. 4).

Burlington features a well-developed grid street network that distributes trips once into the city. More non-single occupant vehicle (SOV) trips are made within Burlington than anywhere else in the region. Nearly 4 percent of work trips are made by transit, and 18 percent of work trips are walk/bike trips. This is a surprisingly high percentage given Burlington’s small size and cold climate. Add in the carpool share and only two thirds of all work trips within Burlington are made in SOVs (Chittenden County Metropolitan Planning Organization, 2005, p. 67).

Recent research has shown that block sizes within much of the urban growth area are often large and scaled to cars rather than pedestrians...Analysis of urban form and basic infrastructure in urban centers and clusters in the region suggests that deficiencies in these areas have significant performance impacts on both the local and metropolitan transportation systems (Puget Sound Regional Council, 2007, p. 27).

Very few MPOs include local and developer funding for minor roads in their plans, budget regional resources for them, or establish street connectivity guidelines. The Denver RTP budgets for them:

While local streets are not depicted as part of the regional roadway system, they are important for providing access to and through local developments and neighborhoods. The costs to build and maintain local streets, including collectors and minor arterials, are included in the 2035 MV RTP (Denver Regional Council of Governments, 2009, p. 47).

The Sacramento RTP allocates regional resources to minor roads. By the mid-1970s, the Sacramento region had decided not to expand its freeway system further. Roadway investments in the 2035 RTP are instead of two principal types:

- $2.9 billion ($5.0 billion in escalated costs) goes to state highway improvements, mainly to complete four-lane highways to connect the northern counties with the rest of the region and add carpool lanes to urban freeways.
- $8.3 billion ($14.3 billion in escalated costs) goes to local road improvements, including intersection improvements, safety projects, signal timing, road widening in growth areas, and new connections for local access (Sacramento Area Council of Governments, 2008, p. 9).

The City of Charlotte has established a connectivity policy that emphasizes a system of streets providing multiple routes and connections between origins and destinations.

Connectivity is important because a highly connected street network can greatly reduce trip lengths, thereby reducing vehicle miles travel which in turn results in reduced emissions (Mecklenburg-Union Metropolitan Planning Organization, 2010, pg. 8).
Highway Maintenance

Conventional Practice

The conventional practice is to split available revenues between highway maintenance and highway expansion, leaving both about equally underfunded relative to the amounts determined in needs assessments. The Sacramento RTP notes:

While there are major investments in transit operations and road maintenance in the MTP2035, these areas are chronically under-funded and would benefit from additional funds (Sacramento Area Council of Governments, 2008, p. 35).

Funding for road maintenance and rehabilitation in Sacramento is said to fall 30 percent short of needs (Sacramento Area Council of Governments, 2008, p. 172).

Similarly, the San Diego RTP notes:

As the region’s transportation system ages, the ongoing costs to maintain our existing infrastructure require a significant share of our future transportation funds. The limited revenues under the other [reasonable] scenarios were not sufficient to fund the full level of estimated highway rehabilitation needs (San Diego Association of Governments, 2007, p. 4-12).

Local road maintenance needs alone in San Diego exceed existing revenues by nearly $1.5 billion (San Diego Association of Governments, 2007, p. 4-16).

The Denver RTP devotes $11.3 billion to preserve and maintain the regional roadway system, far less than the $19.5 billion needed (Denver Regional Council of Governments, p. 105). The Portland RTP refers to a $422 million backlog of unmet maintenance needs in the City of Portland. “Without new revenue, that backlog is expected to continue growing at a rate of $9 million per year” (Portland Metro Regional Government, 2010, p. 1-26). The Austin RTP notes that maintenance has been deferred on the Texas state highway system. “Recently, the Texas Transportation Commission has recommended shifting future resources from added capacity projects to maintenance activities to cover ballooning maintenance needs” (Capital Area Metropolitan Planning Organization of Austin, 2010, p. 62).

Interestingly, highway maintenance needs are left unfunded even in some regions where the stated priority is system preservation, or “fix it first.” Atlanta has a fix-it-first policy. Yet, highway expansion projects absorb more of the budget than do highway maintenance projects, and maintenance needs go unfunded (Atlanta Regional Commission, 2007, pp. 52, 55). Los Angeles gives priority to “maintenance and preservation” over “system completion and expansion.” Yet, the RTP reports a funding shortfall for highway maintenance and preservation of $30 billion through 2035 (Southern California Association of Governments, 2008, p. 17). The Colorado Springs RTP states: “...neglecting the preservation needs of the Pikes Peak region is not a rational policy choice; deferring maintenance due to fiscal pressure would necessitate spending substantially more on transportation investments in the future” (Pike’s Peak Area Council of Governments, 2008, p. 57). Highway maintenance was a top priority in both rounds of a hypothetical spending exercise in which public participants were asked how they would like to spend available funds.
Yet, the Colorado Springs RTP leaves highway maintenance and operation underfunded by a wider margin than new construction.

The latest Kansas City RTP gives highway maintenance “increased priority.” However, a preliminary analysis performed by MPO staff indicates that maintenance spending is still far below the optimum level, and the Greater Kansas City Chamber of Commerce estimates the backlog of deferred maintenance needs at $520 million (Mid-America Regional Council, 2010, p. 4-4). At the same time, the region is funding dozens of new highway capacity projects.

Figure 29: Effect of Deferred Maintenance: Pavement Conditions (Mid-America Regional Council, 2005, pg. 2-14)

Figure 30: New Highway Capacity Projects (Mid-America Regional Council, 2005, pg. 4-15)

Figure 28: Available and Needed Funding in Millions (based on Table E-1, Pike’s Peak Area Council of Governments, 2008, pg. E-1)
Best Practice

The best practice is fix-it-first in word and deed. The reasons are twofold. First, roads in poor condition damage tires and suspension systems, increase fuel consumption, and increase travel time.

The American Association of State Highway and Transportation Officials’ (AASHTO) Rough Roads Ahead report estimates that poor road conditions in the Greater Philadelphia region cost the average driver $525 per year in additional vehicle expenses (Delaware Valley Regional Planning Council, 2009, p. 6).

According to a 2005 report card on Maryland’s infrastructure by the American Society of Civil Engineers (ASCE), 45 percent of Maryland’s major roads are in poor or mediocre condition. Driving on roads in need of repair costs Maryland motorists $1.4 billion a year in extra vehicle repairs and operating costs (Baltimore Regional Transportation Board, 2007, p. 95).

The second reason is illustrated in the accompanying quote and figure from Los Angeles. Deferred maintenance leads to higher costs in the long run, as roads that could have been patched or resurfaced ultimately need to be rehabilitated or reconstructed.

Whereas pavement surface damage requires an investment of $64,000 per lane-mile to bring it to a state of good repair, the costs escalate significantly if these investments are not secured in a timely manner. The costs for minor damage repair escalate more than fivefold to $387,000, and the costs for major damage repair escalate to an astronomical $900,000 per lane-mile (Southern California Association of Governments, 2008, p. 13).

Four RTPs represent varying commitments to fix-it-first. At least on paper, the most unequivocal commitment is that of the St. Louis MPO.

The Council was progressive nearly 15 years ago when it established preservation as the region’s top priority for transportation investment. The region’s stakeholders and political leaders recognized how integral a high quality transportation system is to maintaining the social and economic vitality of our region. Since that time, the region has made great strides in not only maintaining, but improving the condition of the existing system (East-West Gateway Council of Governments, 2007, p. 20).

The plan notes that many metropolitan areas have neglected their maintenance responsibilities, in favor of highway expansion. This penchant for expansion over preservation has created an enormous national burden, as many metros try to catch up on preservation needs.

Figure 31: Preservation Cost-Effectiveness (Southern California Association of Governments, 2008, pg. 70)
“In fact, the most recent report on the status of the nation’s transportation system estimates that it will cost $78.8 billion annually to maintain America’s current highway and bridge system in its current condition between 2005 and 2024, and an additional $51.9 billion to actually improve it” (East-West Gateway Council of Governments, 2007, p. 20).

In St. Louis, 70 percent (p. 29) of the region’s highway budget goes to maintenance and operation, while only 15 percent goes to system expansion (East-West Gateway Council of Governments, 2007, p. 29).

The San Francisco RTP has a somewhat less ambitious policy, but one that is impressive nonetheless in its use of discretionary funds for local street maintenance:

- This plan not only reaffirms the region’s long-standing “fix it first” maintenance policy but also expands our commitment to maintaining and operating our existing local roadway and transit systems. The Transportation 2035 Plan directs $7 billion in discretionary funds to maintain local roadways at current pavement conditions, and $6.4 billion to close funding shortfalls for the highest-rated transit assets (Metropolitan Transportation Commission, 2009, p. 14).

The $7 billion is enough only to maintain the current state of roadway repair, at which about 22 percent of local roadways are in poor or failed condition. The performance objective chosen for local roadway maintenance is more ambitious than current funding allows — to reduce to 13 percent the share of local roadways in poor or failed condition (Metropolitan Transportation Commission, 2009, p. 28).

The third example of fix-it-first is the Philadelphia RTP.

- Following the lead of both state departments of transportation, the Connections Plan pursues a policy to “fix-it-first,” which prioritizes funding for maintaining the existing roadway and transit networks. The goal is to achieve and maintain a state of good repair for existing transportation infrastructure before undertaking significant expansions to the system. Almost 75 percent of anticipated revenues have been allocated to rebuilding the highway and transit infrastructure in the region, and funding for new highway capacity is capped at 10 percent of total highway revenues (Delaware Valley Regional Planning Council, 2009, p. 9).

Following a fix-it-first policy, the region has been able to make progress on pavement condition. From 2005 to 2007, the number of lane miles rated as deficient in the region has decreased by 259 miles, or 4.2 percent of the total (Delaware Valley Regional Planning Council, 2009, p. 34).

Finally, there is the Honolulu RTP, which budgets $1 billion for “highway system preservation” beyond the $1.38 billion for highway operations and routine maintenance:

- In order to counter some of the neglect of the past, the plan increases spending for system preservation in the early years, then reduces the amount of spending in later years back to traditional levels... (Oahu Metropolitan Planning Organization, 2006, p. 14)
Transportation System Management (TSM)

Conventional Practice

TSM and its cousin, intelligent transportation system (ITS) technology, are broadly defined as measures that make the most efficient use of existing capacity, as opposed to adding capacity. They are also referred to as “operational strategies.” “Systems Management helps get the most efficiency out of our existing system, makes travel services more reliable, convenient, and safe, and reduces traffic delays caused by accidents and incidents” (San Diego Association of Governments, 2007, p. 1-8).

Relative to highway capacity expansion, the advantages of TSM/ITS are their low cost, short implementation period, and minimal environmental impact.

This category of expenditure includes a grab bag of diverse measures:

- Roadway geometric improvements (turn lanes and auxiliary lanes)
- Spot widening
- Grade separated intersections
- Conversion to HOV lanes
- Reversible travel lanes
- Park-and-ride facilities
- Traffic signal actuation
- Traffic signal coordination and synchronization
- Traffic-responsive traffic control
- Traffic-adaptive traffic control
- Replacement of signals with roundabouts
- Left turn restrictions
- Relocation of driveways
- Peak period parking restrictions
- Transit signal priority treatment for transit vehicles
- Detection and countdown timers for bicycles and pedestrians
- Surveillance for traffic incidents
- Freeway service patrols (roving tow trucks)
- Freeway ramp meters
- Ramp meter bypass lanes
- Electronic toll collection
- Real-time traffic information
- Work zone management
- Traffic management centers (to coordinate all of the above)

The conventional practice is to label TSM/ITS “cost effective” and a “priority.” Yet, when it comes to funding, TSM and ITS often come up short. The two together seldom receive more than 2 percent of total funding.

The Denver RTP states:

Management and operational strategies to improve the efficiency and reliability of the roadway system are very important in light of the limited revenues that will be available for expansion of the system (Denver Regional Council of Governments, 2009, p. 108).

However, the RTP goes on to state that “anticipated management and operational expenditures cover less than half of the identified need (Denver Regional Council of Governments, 2009, p. 108).” Moreover, the Denver RTP devotes 15 times as much funding to road expansion as to system management and operational strategies (Denver Regional Council of Governments, 2009, p. 107).

The Los Angeles RTP states that:

In all parts of the region, operational and technological improvements have the potential to maximize system productivity in a more cost-effective way than simply adding capacity (Southern California Association of Governments, 2008, p. 104).

For this reason, the RTP makes up 20 percent of the original shortfall in TSM funding with diverted funds. This incremental investment of over $2 billion in advanced operational strategies on freeways and arterials is projected to recapture 20 percent of the lost productivity due to congestion (Southern California Association of Governments, 2008, p. 170).

Nonetheless, this leaves 80 percent of the original shortfall unfunded (Southern California Association of Governments, 2008, p. 201). Moreover, the RTP earmarks 20 times as much funding for general purpose freeway and arterial lane expansion as for TSM-type activities (Southern California Association of Governments, 2008, p. 161). The RTP’s lame justification:

As these allocations are programmed and implemented, SCAG hopes that the benefits will become apparent to decision-makers and the public, and that additional funding can be secured to address the remaining shortfall (Southern California Association of Governments, 2008, pg. 19).

Figure 34: Recapturing “Lost Lane-Miles” Through an Incremental Investment in TSM (Southern California Association of Governments, 2008, pg. 170)
**Best Practice**

The best practice is to make TSM a priority, and fund it accordingly. The Atlanta RTP does exactly that. System management, optimization, and operations (which includes highway and transit O&M) are the top priority of the MPO. The category of “non-capacity roadway optimization” receives more than 5 percent of total funds, more than in any other RTP.

While it is beyond the scope of this review to sort through the list of TSM measures and identify the most cost-effective ones, we will make certain observations based on data in the RTPs. Several of the RTPs cite the Federal Highway Administration finding that most congestion on freeways is “nonrecurring,” that is, due to incidents that do not occur on a daily basis. “It is generally agreed that the majority of Kansas City’s freeway congestion is caused by incidents (e.g., accidents, disabled vehicles, inclement weather) rather than just high volumes of traffic” (Mid-America Regional Council, 2000, p. 9-12). To deal with nonrecurring congestion, MPOs fund incident management systems that pre-position incident response personnel and equipment and use advanced technology to detect and verify traffic incidents. These measures improve response time and allow for quicker removal of incidents and restoration of traffic flow. As for recurring freeway congestion, a measure that would seem to be particularly cost-effective is the installation of freeway ramp meters to ensure that merging traffic does not exceed the merge area or weave area’s capacity to absorb that traffic at a point. Ramp meters spread out the entering vehicles. Ramp meters are also used to control overall flow to assure that downstream traffic flow remains stable.

The accompanying figure from the San Francisco RTP shows the tremendous reduction in travel time with the introduction of ramp meters.

As for recurring congestion on the arterial system, nearly all delay on surface streets occurs at intersections, so any measure that reduces intersection delay will do more for travel speeds than any action at midblock.

**Figure 35: Priority Order (Atlanta Regional Commission, 2008, pg. 9)**

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<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>SYSTEM MANAGEMENT, OPTIMIZATION &amp; OPERATIONS (Smart Corridors)</td>
<td>DEMAND MANAGEMENT (TDM, Bike/Ped, LCI, Others)</td>
<td>SYSTEM EXPANSION (Transit, Road)</td>
</tr>
<tr>
<td>$39.7 Billion</td>
<td>$2.1 Billion</td>
<td>$25.3 Billion</td>
</tr>
<tr>
<td>59%</td>
<td>3%</td>
<td>38%</td>
</tr>
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**Figure 36: Nationwide Causes of Delay (Baltimore Regional Transportation Board, 2007, pg. 148)**

- Special Events
- Work Zones
- Incidents
- Bad Weather
- Poor Signal Timing
- Bottlenecks
- Recurring
- Non-recurring
At moderate travel volumes, roundabouts produce less intersection delay than do traffic signals, and several RTPs call for the use of roundabouts in such cases (Capital Area Metropolitan Planning Organization of Austin, 2010, p. 11; Chittenden County Metropolitan Planning Organization, 2005, p. 40; Ohio-Kentucky-Indiana Council of Governments, 2008, p. 8-6; Capital Area Metropolitan Planning Organization and Durham-Chapel Hill-Carrboro Metropolitan Planning Organization, 2009, p. 71; Tri-County Metropolitan Planning Commission, 2010, p. 8-9).

At higher traffic volumes or with imbalanced flows, signals are likely to outperform roundabouts, provided that they are optimally timed. Many RTPs earmark funds for signal coordination and synchronization. A few go beyond the standard technology in the United States to endorse traffic-responsive and traffic-adaptive signal control.

Traffic signal systems in nearly all urbanized areas now operate in a time-of-day mode; timing plans are activated at different times of day based on normal traffic conditions. When conditions are abnormal, these systems cannot respond. The U.S. lags behind some of our sister countries in this respect.

Traffic-responsive systems monitor traffic at critical intersections and select the most appropriate timing plans. Traffic-adaptive systems go even further, continually adjusting and optimizing signal settings as traffic fluctuates, anticipating gridlock before it occurs.

Traffic-adaptive systems have been used in Britain and Australia for decades, and have begun to be deployed in the U.S., with impressive results. The Portland RTP reports that deployment of adaptive traffic control in the city of Gresham had resulted in a 15 percent reduction in travel time in the test corridor, “benefiting automobiles, trucks and buses” (Portland Metro Regional Government, 2010, p. 2-79).

Figure 37: Sample Travel Time Comparison Before and After Ramp Metering (Metropolitan Transportation Commission, 2009, pg. 55)

Figure 38: Comparison of Travel Times under Uncoordinated, Time-of-Day, and Adaptive Traffic Control (Portland Metro Regional Government, 2010, pg. 2-79)
Travel Demand Management (TDM)

Conventional Practice

Without exception, the emphasis in RTPs is on increasing the supply of transportation capacity, not reducing the demand for transportation services. As the Raleigh and Durham RTPs note:

Each year, hundreds of millions of dollars are spent in the region on the supply side of mobility: building and maintaining roads, buying and operating buses, building sidewalks and bicycle facilities. (Yet) some of the most cost-effective mobility investments we can make are on the demand side: encouraging commuters to use our transportation facilities as efficiently as possible by carpooling, vanpooling, taking transit, telecommuting or walking or bicycling. (Capital Area Metropolitan Planning Organization and Durham-Chapel Hill-Carrboro Metropolitan Planning Organization, 2009, p. 67).

Travel demand management strategies reduce the demand for peak-period single-occupant vehicle travel by 1) promoting alternatives to driving alone, 2) shifting trips out of peak travel periods, or 3) eliminating the need for certain trips. The Chicago RTP lists the following strategies:

- Ridesharing Programs. Ridesharing can reduce congestion by reducing the number of vehicle trips, in turn leading to reductions in VMT.
- Car Sharing Programs. Car sharing reduces VMT by reducing vehicle ownership; cars are available when needed, but discretionary trips may be more likely made by transit or non-motorized modes.
- Alternative Work Arrangements. Alternative work arrangements reduce VMT by providing work sites closer to homes, or by spreading traffic to non-peak periods.
- Transit and Rideshare Incentives. Economic incentives for transit and ridesharing can reduce the costs of these modes, encourage their use, and thus reduce VMT.
- Parking Management. Parking management manages the cost of parking, reduces its availability, provides information regarding availability, so as to reduce travel demand and reduce excess VMT searching for parking spaces.
- Guaranteed Ride Home Programs. Guaranteed ride home programs reduce VMT through increased transit use by assuring transit users a way home should they need to travel when transit is not available (Chicago Metropolitan Agency for Planning, 2008, p.72).

In the early 1990s, local trip reduction ordinances, requirements of the California South Coast Air Quality Management District’s Regulation XV (Rule 1501), and the Clean Air Act Amendments of 1990 (CAAA) made TDM programs mandatory. Employer opposition caused several states to suspend their programs. Federal legislation in late 1995 allowed states to implement programs on a voluntary basis. California, the early laboratory for such programs, repealed Rule 1501 in December 1995.

Since then, TDM efforts have been fragmented and ad hoc in most metropolitan regions. TDM programs are a rounding error in the typical RTP budget. Of those relatively few plans that break out expenditures for TDM, they almost always represent less than 1 percent of regional transportation expenditures. Moreover, as with many other stated priorities, TDM programs are
only partially funded in many RTPs. The Denver RTP is typical in stating the importance of TDM services:

With limited funding available for expansion of the roadway system, TDM services (see Chapter 4, Section J) will be critical to reducing motor vehicle travel demand and offering mobility options (Denver Regional Council of Governments, 2009, p. 108).

Nonetheless, just a little more than half of the envisioned cost of providing TDM services is funded in Denver’s fiscally constrained RTP (Denver Regional Council of Governments, 2009, p. 106).

**Best Practice**

The first best practice is to fully fund TDM programs within RTPs. “One of the most cost-effective ways to reduce congestion and the demand for new and wider roadways is to promote and support travel demand management” (Pima Association of Governments, 2010, p. 57).

A second best practice is to coordinate regional TDM activities. In the New York region, the New York Metropolitan Area Regional Commuter Choice Program delivers integrated and coordinated alternatives to driving alone to work. The program, sponsored by New York State DOT with the participation of the New York MPO’s member agencies, supports commuter assistance services, coordination of online rideshare matching services, and coordination of mobility management programs (New York Metropolitan Transportation Council, 2009, p. 5-4). In the Raleigh-Durham region, all of the TDM service providers and funding sponsors came together in 2007 to craft a seven-year Triangle Region Transportation Demand Management Plan (Capital Area Metropolitan Planning Organization and Durham-Chapel Hill-Carrboro Metropolitan Planning Organization, 2009, p. 68).

A third best practice is to set ambitious but realistic targets for employee trip reduction. The Triangle Region TDM Plan seeks to reduce the growth of commuter travel by 25% (Capital Area Metropolitan Planning Organization and Durham-Chapel Hill-Carrboro Metropolitan Planning Organization, 2009, p. 68). The Burlington RTP assumes that the region’s TDM program will reduce home to/from work single-occupant vehicle trips by 10 percent to the major employment centers in the region (Chittenden County Metropolitan Planning Organization, 2005, p. 41).

A fourth best practice is to focus TDM efforts within activity centers, the same centers that are promoted in many RTPs. That is because centers concentrate trip ends, increasing the effectiveness of ride matching, flex-time, and transit service. Washington State amended its Commute Trip Reduction (CTR) Program in 2006 to focus on urban growth areas and centers where TDM is most needed and where it will have the greatest impact on travel demand. TDM promotion and facilitation efforts are offered throughout the Denver region but are concentrated in:

- Downtowns of major cities and high employment concentration areas;
- Along highway corridors with bus/HOV lanes; and
- Adjacent to rapid transit lines/stations and high transit service locations (Denver Regional Council of Governments, 2009, p. 86).

A fifth best practice is to make TDM mandatory for large employers (something that requires state or local legislative action). The Oregon Employee Commute Options Rule mandates the Regional Travel Options Program in the Portland region. Oregon was one of only two states (Washington was the other) where the percentage of people driving alone to work decreased between 1993 and 2000 (Portland Metro Regional Government, 2010).
Transit Expansion

Conventional Practice

The conventional practice is to fund highways heavily, and transit lightly, and then lament the fact that travelers seem to prefer the automobile. Consider the following passages from the Kansas City RTP.

The Kansas City region continues to be one where automobiles far surpass other modes of transportation as the preferred method of travel. This has led to the development of an extensive roadway system while the transit system has maintained a fairly stable level of operation (p. 2-12).

Kansas City’s system of roadways is among the most extensive in the nation. Recently, new statistics made available from the Federal Highway Administration confirm that Kansas City continues to possess the most freeway miles per person of all urbanized areas with populations greater than 500,000 (p. 2-12).

It should be noted that the sharp drop in the KCATA’s ridership during the early 1980s is in part due to the significant reduction in service implemented at that time...ridership has decreased slightly since 2001, mostly due to a reduction in scheduled service miles resulting from decreased funding support (p. 10-9).

...much of the region’s services, especially in lower-density areas, is provided in the peak period only, with many areas having no off-peak services (p. 5-4).

Travelers in Greater Kansas City take advantage of the short travel times and low levels of congestion by traveling more miles per person each day than residents of other metropolitan areas (p. 2-21).

It is a self-fulfilling prophecy that transit cannot compete with the automobile if transit service is cut and freeways are expanded. Only 1.3 percent of commute trips in Kansas City are by transit, one of the lowest shares for a large urbanized area in the U.S (Mid-America Regional Council, 2005, p. 2-15).

Figure 39: Freeway Capacity Comparison: Freeway Miles Per 1,000 Persons (Mid-America Regional Council, 2005, pg. 2-12)

Figure 40: Transit Funding Sources Comparison (Mid-America Regional Council, 2005, pg. 5-26)
Best Practice

The best practice gives transit investments as much priority as highway investments, because transit investments can ease traffic congestion without inducing additional VMT and the social costs that accompany it (greenhouse gas emissions, for example). The Texas Transportation Institute estimates that in Boston, annual person-hour delay on the roadways of this region is 54 percent lower than what it would be without public transportation (Boston Region Metropolitan Planning Organization, 2007, p. 6-6). TTI has performed similar calculations, with similar results, for other large regions.

Because it represents a win-win for congestion and VMT, transit gets more funding than its mode share might suggest. In San Francisco:

Almost two-thirds of plan expenditures are spent on public transit (see pie chart top middle) in an effort to reduce vehicle miles traveled, congestion on Bay Area freeways, and greenhouse gas and particulate matter emissions (Metropolitan Transportation Commission, 2009, p. 37).

In Boston, the MPO voted to “flex” $208 million in highway funding for transit projects (Boston Region Metropolitan Planning Organization, 2007, p. 12-2). All of the public transportation funds are being used for improvements to the regional public transportation system (Boston Region Metropolitan Planning Organization, 2007, p. 12-10, 12-11). Based upon this distinction, the major infrastructure and expansion program spends approximately two dollars on transit projects for every three dollars on highway projects.

Even in Los Angeles, with its autocentric culture, more is now being spent on transit than on highways.

Beginning in the 1980s, a major shift occurred away from building roadways and into transit projects and services. Between 2000 and 2005, regional transit use increased by more than 16 percent, and in 2005, our region reached the highest ridership per capita in about 20 years (Southern California Association of Governments, 2008, p. 13).

These RTPs illustrate two other principles of the transit oriented planning. First, a full range of transit service types should be provided, including the newest addition to the transit family, bus rapid transit. Second, land use changes are should be planned for transit station areas in order to boost transit productivity.

On the range of services provided, Denver, Minneapolis-St. Paul, Portland, Salt Lake City, and others now have it all (Denver Regional
In smaller urbanized areas, “having it all” may mean having fewer than the full array of transit service types. In Tucson, for example, it means having new BRT and streetcar services and in smaller urbanized areas, “having it all” may mean having fewer than the full array of transit service types. In Tucson, for example, it means having new BRT and streetcar services and possibly commuter rail at some point, but no light rail (Pima Association of Governments, 2010, p. 37).

On the promotion of transit-oriented development around stations, many previously auto-centric cities have followed the lead of Washington, D.C., San Francisco, and Portland. Charlotte developed the 2025 Integrated Transit/Land Use Plan, redirecting development from auto-oriented wedges to transit-served corridors. It then took the plan to the voters, who approved a half cent sales tax for transit in October 1998.

The plan calls for investment in five rapid transit corridors and significant expansion of complementary and supporting bus transit services. The most innovative concept in this plan is the requirement for ongoing, close coordination of land use decisions with the investments in the transit system. Major Investment Studies (MIS) have been completed for the five rapid transit corridors. Those studies considered all reasonable alignments and technologies within each corridor. Light rail transit was selected for the South Corridor when that corridor’s MIS was completed in 2000, and the corridor’s Lynx Blue Line began operations in November, 2007 (Mecklenburg-Union Metropolitan Planning Organization, 2010, p. 1-4).

The Integrated Transit/Land-Use Plan was followed by the 2030 Transit Corridor System Plan, adopted by the Metropolitan Transit Commission in 2006. When completed, the plan will serve four times as many transit riders as the present system, and will include 14 miles of BRT, 21 miles of LRT, 16 miles of streetcar, 25 miles of commuter rail, and an extended network of bus service. Over the next 30 years, growth is expected to intensify centers, corridors, and transit station areas (Mecklenburg-Union Metropolitan Planning Organization, 2010, p. 1-4, 9-7).
Bicycle and Pedestrian Improvements

Conventional Practice

The conventional practice is to treat bicycle and pedestrian travel as somewhat incidental to the regional transportation system. It is mentioned in the RTP, in a paragraph or section, but is in no way a priority of the plan. “... pedestrian issues have not been embodied in MARC’s previous transportation plans in the past other than in a cursory fashion” (Mid-America Regional Council, 2005, p. 7-10). “While many of the denser parts of the region have comprehensive sidewalk networks, the more rural and recently developed suburban areas have been designed primarily for the automobile, as pedestrian facilities such as sidewalks and crosswalks are not consistently included in roadway projects and many intersection designs include free-flowing turn lanes. Even in areas with comprehensive sidewalk networks, there are still significant needs.” (Baltimore Regional Transportation Board, 2007, p. 45).

In most regions, bicycle and pedestrian travel is not forecasted along with auto and transit travel. The region (or state within which it is located) has no “complete streets” policy to guarantee that new roadways accommodate bicycle and pedestrian users. And the region has no plan for closing gaps in the existing bicycle and pedestrian networks.

Best Practice

“One hallmark of a livable city is that its public spaces are actively used and the outdoors can be enjoyed” (Oahu Metropolitan Planning Organization, 2006, p. 7). Between 1991 and 2004, the City of Portland invested $12 million in the city’s bikeway network, increasing the mileage from 78 to 256. The network includes bike lanes and designated "bike boulevards"—low-traffic city streets suitable for bicycling. Bicycle counts released for 2006 show significant increases in bicycle traffic across the city, with bicycle traffic constituting 10 percent of the total trips across the bridges (Portland Metro Regional Government, 2009, p. 1-52).
One best practice with respect to bicycle and pedestrian travel is to adopt ambitious mode share targets. The Seattle MPO has set a goal of 20 percent of all trips by biking and walking by 2030 (Puget Sound Regional Council, 2007, p. iv). The current mode share is 5 percent. The Dallas-Ft. Worth MPO has set a goal of 8 percent of all trips by biking and walking by 2030 (North Central Texas Council of Governments, 2009, p. 172). The mode share in the most recent household travel survey was 5.5 percent.

Another best practice is to adopt a complete streets policy so all future roadway projects accommodate bicyclists and pedestrians. Some MPOs, like New York’s, have no formal policy but rely on state and local governments to pursue complete streets:

The region is at the forefront of designing and operating transportation infrastructure that supports all types of travel. NYMTC members continue to develop what have been called “complete streets,” streets that are open and safe for all users. Benefits include improved access to the transit system, which encourages higher transit ridership and discourages auto use (New York Metropolitan Transportation Council, 2010, p. 1-29).

Other MPOs, like St. Louis’, try to cajole constituent governments into providing complete streets:

In 2006, the Council launched the Great Streets Initiative to expand the way communities think of transportation. Rather than viewing a roadway project as solely a way to move more cars and trucks faster, the goal of the St. Louis Great Streets Initiative is to trigger economic and social benefits by centering communities around interesting, lively and attractive streets that serve all modes of transportation (East-West Gateway Council of Governments, 2007, p. 85).

Going a step further, the Sacramento MPO, in coordination with the local Complete Streets Coalition, has developed a Complete Streets Resource Toolkit. The toolkit is part of SACOG’s complete streets technical assistance program. The toolkit includes such things as fact sheets, case studies, presentations, and photo simulations. It puts a wealth of resources at the fingertips of any advocate, community member, planner, or engineer.
A third best practice involves the retrofitting of existing streets with sidewalks and bike lanes. Sidewalks are currently provided on about 70 percent of the regional roadway system arterials within the Denver urban growth boundary. An additional 500 linear miles are needed to complete the system (Denver Regional Council of Governments, 2009, p. 59). Even the Portland region has major gaps in its pedestrian network. In 2001, the region had 1,230 miles of potential pedestrian facilities in transit/mixed use corridors and pedestrian districts. However, only 821 miles of those 1,230 potential miles had sidewalks, for a pedestrian system that was only 66 percent complete (Portland Metro Regional Government, 2010, p. 1-56).

In this regard, the best practice is to develop bicycle and pedestrian master plans for completing these networks, and to fully fund these plans. Atlanta, Denver, and St. Louis have adopted such plans (Atlanta Regional Commission, 2008; Denver Regional Council of Governments, 2009; East-West Gateway Council of Governments, 2007). Each New York sub-area has developed its own pedestrian and bicycle plans to guide future investments in non-motorized transportation (New York Metropolitan Transportation Council, 2010, p. 6-21). San Diego is developing a regional bicycle plan, and the San Diego MPO requires local agencies to develop pedestrian master plans in order to be eligible for discretionary, non-motorized funding administered by the MPO (San Diego Association of Governments, 2007, p. 6-50). The Honolulu MPO has incorporated projects from the Bike Plan Hawaii and is developing a pedestrian master plan (Oahu Metropolitan Planning Organization, 2006, p. 7). The Reno MPO has a Regional Bikeways Plan that will place bike lanes are on nearly all roadways in the central area of the region. The RTP anticipates that 80 percent of the plan will be completed by 2020, and that 100 percent will be completed by 2040 (Regional Transportation Commission of Washoe County, 2008, p. 2-10).

Of those regions earmarking funds for bicycle and pedestrian facilities, none spends as much on those facilities as the mode share would seem to justify. The highest percentage is 3.36 percent of total funds in Sacramento. $1.4 billion ($2.4 billion in escalated costs) are earmarked for exclusive bicycle and pedestrian improvements, including bicycle trails, sidewalks, ADA retrofits, and supporting facilities. In addition, 25 percent of the road capital projects have a bicycle or pedestrian feature that is not included in the $1.4 billion total (Sacramento Area Council of Governments, 2008, p. 9).

The Denver MPO envisions that by 2035 sidewalks or multipurpose trails will be provided along all applicable roadways within the urban growth boundary (Denver Regional Council of Governments, 2009, p. 56). The San Francisco MPO has earmarked $1 billion to fully fund and complete its bikeway network (Metropolitan Transportation Commission, 2009, p. 16).

**Figure 45: Reno Regional Bikeways Plan for Central Area (Regional Transportation Commission of Washoe County, 2008, pg. 5-7)**
A fourth best practice is to forecast bicycle and pedestrian travel as available mode choices, accounting for mode shifts as facilities are improved and land use patterns become more compact. The common failure to even acknowledge the possibility of nonmotorized trips puts these modes at a competitive disadvantage vis-à-vis motorized modes when it comes to funding decisions. Enhancing four-step travel demand models to include nonmotorized trips in trip generation and mode choice steps, or using post-processing to split trip tables between motorized and nonmotorized modes, represent best modeling practices (see Transportation and Land Use Modeling).

**Project Selection**

**Conventional Practice**

The conventional practice is to base funding decisions primarily on roadway levels of service. Travel demand models are used to forecast future traffic flows on different links in the existing and committed roadway network. Links whose future traffic volumes exceed capacity at the adopted roadway level-of-service standards then receive funding priority. Travel demand models are also used to test if links in the future roadway network, with capacity improvements, will operate at acceptable levels of service.

While the conventional practice has been tempered in most metropolitan areas, vestiges of the old systems remain. Many MPOs still use roadway level-of-service measures and standards to determine deficiencies in roadway networks. Several still prioritize projects on the basis of these determinations. If anything, this practice is encouraged by federal requirements that large regions have congestion management processes.

The Chattanooga MPO, for example, estimates levels of service based on the following criteria:

\[
\begin{align*}
V/C \leq 0.60 & \quad \text{LOS A} \\
0.61 < V/C \leq 0.70 & \quad \text{LOS B} \\
0.71 < V/C \leq 0.80 & \quad \text{LOS C} \\
0.81 < V/C \leq 0.90 & \quad \text{LOS D} \\
0.91 < V/C \leq 1.0 & \quad \text{LOS E} \\
V/C > 1.0 & \quad \text{LOS F}
\end{align*}
\]

Per these criteria, V/C is the volume-to-capacity ratio on a given link. The MPO uses LOS D as an acceptable level of service. Less than LOS D indicates unacceptable congestion, constitutes a failure in LOS terms, and entitles a link to funding priority (Chattanooga Hamilton County North Georgia Transportation Planning Organization, 2009, p. 3-14).

Likewise, the Reno MPO uses the level-of-service standards in the accompanying table to assess the need for and location of future street and highway improvements.
Best Practice

The best practice is to recognize that regions “cannot pave their way out of congestion,” and instead prioritize funding based on broad public purposes. The inability for a region to build roads fast enough to keep up with demand is acknowledged in so many words by the Baltimore, Cincinnati, Eugene, Raleigh-Durham, and Tucson MPOs.

The RTP recognizes that sole reliance on more and bigger roadways to meet the transportation demand is shortsighted. Even if adequate funding was available, given the growth anticipated in the region, it is unreasonable to assume the region can build its way out of traffic congestion. The technical evaluation of TransPlan alternatives indicated that the travel demand associated with growth will overload the transportation system, even with major capacity-increasing projects. Experience from cities all over the world suggests that building roads encourages more people to use cars, thereby perpetuating the transportation challenges (Central Lane Metropolitan Planning Organization, 2007, Chapter 1, p. 4).
We have already argued that as a best practice, the following project categories deserve funding priority: maintenance projects under a fix-it-first policy, TSM and TDM projects under a cost-effectiveness policy, and new capacity projects serving existing centers under a smart growth policy.

For other new capacity projects, funding criteria can be based on the broad goals and objectives that nearly all MPOs have adopted. They can also be based on the federal metropolitan planning factors whose consideration has been mandated in federal legislation since ISTEA.

The Seattle RTP prioritizes as follows:

1. The first priority should be to maintain, preserve, make safe and secure, and optimize existing transportation infrastructure and services. The most cost-effective infrastructure investments are usually those that maintain, preserve, improve safety and security, and optimize existing assets.
2. Investments should emphasize continuity and complete discrete elements of the transportation system. Completing missing pieces of larger systems is a regional investment priority.
3. Appropriate investments in all modes should be emphasized to provide an array of travel choices.
4. Transportation investments should be directly linked with measurable transportation, environmental and land use outcomes, and should support the achievement of regional and state benchmarks.
5. Compact development of designated urban centers, high capacity transit station areas, and other communities should be supported through direct investment. Projects that serve and support greater concentrations of activity within the Urban Growth Area are also regional priorities (Puget Sound Regional Council, 2007, p. 22).

For highway capacity projects, project scoring criteria have been linked to broad public goals by MPOs in Baltimore, Boston, Charlotte, Cincinnati, Denver, Indianapolis, and St. Louis, among others (Baltimore Regional Transportation Board, 2007; Boston Region Metropolitan Planning Organization, 2007; Mecklenburg-Union Metropolitan Planning Organization, 2010; Ohio-Kentucky-Indiana Council of Governments, 2008; Denver Regional Council of Governments, 2009; Indianapolis Metropolitan Planning Organization, 2009; East-West Gateway Council of Governments, 2007).

Typically, MPO staff score competing projects on a Likert scale with varying points (0 to 2, 1 to 5, etc.) assigned to each of the criteria. Scores are then summed and used to prepare a list of projects in priority order. The staff list is submitted to the MPO’s board of directors for approval. The voting members of the board have the ultimate say over what is funded, up to the limit of available revenues.

One legitimate concern about the project scoring methodology described above is the
subjective and staff driven nature of the process. In the interest of transparency, it is desirable that scoring criteria be as objective as possible. Tallahassee has done a particularly good job of operationalizing its funding criteria. The criteria themselves are based on the RTP’s goals and objectives, which themselves are based on federal metropolitan planning factors, input from state and local officials, and suggestions from the public.

- Support the economic vitality of the Capital Region;
- Emphasize preservation of the existing transportation system;
- Address the interrelationships between transportation and land use;
- Promote the use of transit and alternative modes of transportation;
- Improve the safety and security of the transportation system;
- Minimize negative community and environmental impacts; and
- Expand the region’s transportation system in an efficient manner.

Scoring criteria relate to each goal. The points awarded for each criterion are about as objective as one can make them. Some examples:

**Existing Capacity Deficiency**
Presently no documented capacity problem 0
Presently at or near capacity (100 or less trips available) 1
Presently over capacity (negative trips available) 2

**Promote Sustainable Development Score**
Project could promote urban sprawl 0
Project recommended as part of a Sector/Master Plan outside urban core 1
Project could promote urban infill or Transit-oriented development 2

**Hurricane Evacuation**
Project not likely to enhance hurricane evacuation 0
Project should enhance hurricane evacuation 1

**Title VI Impacts**
Project has no positive impact to/from/within Title VI areas 0
Project may improve accessibility to/from/within Title VI areas 1
Project likely to improve economic opportunities to/from/within Title VI areas 2

(Capital Region Transportation Planning Agency, 2006, p. 3-1)

**Funding Gaps**

**Conventional Practice**

Federal regulations require MPOs to produce “financially constrained” long-range transportation plans, where project expenditures stay within “reasonably expected” revenues. Nearly all MPOs also conduct needs assessments and produce needs-based plans. Needs typically exceed reasonably expected revenues by a third or more.

The Los Angeles MPO has $273 billion in needs beyond what is funded in its $532 billion fiscally constrained plan (Southern California Association of Governments, 2008, p. 201).

The San Diego MPO has $30 billion in needs beyond its $57 billion financially constrained plan (San Diego Association of Governments, 2007, p. 4-16). The Dallas-Ft. Worth MPO has $59 billion in needs beyond its $71 billion financially constrained plan (North Central Texas Council of Governments, 2009, p. 4). The Atlanta MPO has $21 billion in needs beyond its $67 billion financially constrained plan (Atlanta Regional Commission, 2008, p. 10). The Cincinnati MPO has $3 billion in needs beyond its $10 billion financially constrained plan (Ohio-
Kentucky-Indiana Council of Governments, 2008, p. 3-1. And so on for the others (see figure).

Faced with these huge funding gaps, MPOs typically throw up their hands and accept the shortfall. In Philadelphia:

The Connections Plan does not advocate any particular local funding alternative, but instead issues a challenge to the region’s leaders, stakeholders, and citizenry to reach consensus on new local and regional means to maintain and modernize the region’s critical transportation infrastructure, which impacts both our standard of living and our economic competitiveness. Given the large set of needs that will remain unmet at currently available funding levels, the region needs to seek ways to close its funding gap (Delaware Valley Regional Planning Council, 2009, p. 9).

Likewise, in Charlotte:

Due to the limited amount of funds available, MUMPO considered several different funding scenarios to raise additional revenue, with varying project lists that resulted from the additional revenues. The scenarios considered were:

- No New Revenue (assumes no new funding sources through 2035);
- Additional Quarter-Cent Sales Tax for Roads for both Mecklenburg and Union Counties;
- Additional Quarter-Cent Sales Tax for Transit in Mecklenburg County; and

...Figure 49: Vision Plan vs. Fiscally Constrained Plan in Millions of Dollars (Denver Regional Council of Governments, 2009, pg. 108)

- Additional Quarter-Cent Sales Tax Split Between Roads and Transit in Mecklenburg County.

MUMPO decided (on November 18, 2009) to approve the “No New Revenue” scenario (Mecklenburg-Union Metropolitan Planning Organization, 2010, p. 3).

**Best Practice**

The best practice is to aggressively pursue new and innovative sources to make up the funding shortfall.

The Sacramento MPO has a “Plus 10% List” of projects that would not be affordable without additional funding. The budget was set at 10 percent above the MTP2035 to allow for a reasonable amount of additional revenue that may come from transportation sales taxes, development impact fee increases or other revenue sources (Sacramento Area Council of Governments, 2008, p. 35).

The Raleigh and Durham MPOs have funding gaps of 40 and 22 percent, respectively. This has not stopped them planning for needs.

The current transportation funding programs will not produce enough...
revenue to finance the highway, bus transit, light rail transit and other transportation needs in the Triangle. Therefore, the MPOs have assumed new revenue sources to close this funding gap (Capital Area Metropolitan Planning Organization and Durham-Chapel Hill-Carrboro Metropolitan Planning Organization, 2009, p. 11-H).

New funding sources may include sales taxes, car registration fees, rail bonds, HOT lanes, and new state or federal infrastructure programs.

The Los Angeles MPO also assumes a substantial amount of new funding:

Finally, while recognizing financial constraints, the Plan puts forth a suite of new and innovative funding strategies that are realistic, practical, and achievable within the time frame of the Plan (Southern California Association of Governments, 2008, p. 49).

Of total available revenue during the planning period, more than one-fifth is assumed to come from new sources (see accompanying figure). The new sources include value capture strategies, highway tolls, a local option sales tax extension, container fees, private equity participation, and federal funding for clean freight rail technology.

**Air Quality Conformity**

**Conventional Practice**

The 1990 Clean Air Act Amendments (CAA) require MPOs within air quality nonattainment and maintenance areas to perform air quality conformity tests (also called transportation conformity tests) prior to the adoption of RTPs and Transportation Improvement Programs (TIPs).

A nonattainment area is one that the U.S. Environmental Protection Agency (EPA) has designated as not meeting certain national ambient air quality standards. A maintenance area is one that had a history of nonattainment, but is now meeting national standards. A conformity test is a demonstration that transportation plans, programs, and projects are consistent with the State Implementation Plan (SIP) for attaining the air quality standards. It is determination that motor vehicle emissions will remain within emission budgets established within the SIP. The conformity requirement ensures that federal approval and funding go to transportation activities that are consistent with air quality goals.

If an MPO fails to adopt a new RTP or TIP that stays within the motor vehicle emissions budgets in the SIP, the area faces what is known as a conformity lapse. During this period, the MPO cannot approve funding for new transportation projects or new phases of previously funded transportation projects except for those projects that are adopted as transportation control measures in the SIP or are otherwise exempt from conformity as air quality–neutral activities. Large urbanized areas stand to lose hundreds of millions of dollars in Federal transportation funding if they cannot meet conformity requirements.

Conformity requirements have never resulted in loss of federal transportation funds, which has
caused some observers to view them as toothless. MPOs have always been able to pass the conformity tests for whatever pollutants and years are at issue. This is mainly because technology is producing cleaner running vehicles with each passing model year. It is also because RTPs reduce VMT and emission rates relative to a no-build scenario where congestion is worse and transit is less well funded.

The following determination from the Eugene area is typical of conformity in practice:

The travel forecasting model indicated that the region would be able to maintain conformity with existing national air quality standards through implementation of any of the alternative plan concepts. Despite traffic growth, the offsetting effects of less-polluting and more fuel-efficient new vehicles will cause a net decline in emissions, even under trend conditions. The attainment and maintenance of air quality standards is primarily due to improved auto emission technology, rather than reduced reliance on autos (Central Lane Metropolitan Planning Organization, 2007, Chapter 1, p. 5).

**Best Practice**

Other best practices look to historical precedents for guidance. This best practice charts new territory.

In April 2007, the U.S. Supreme Court ruled in *Massachusetts v. EPA* that the Clean Air Act gives EPA the authority to regulate emissions of greenhouse gases, if they are indeed a threat to human health and welfare. At the time, the court directed the agency to review the latest scientific evidence on climate change in order to make a determination.

In December 2009, EPA Administrator Lisa Jackson announced that the agency had finalized its finding that greenhouse gases, including carbon dioxide, pose a threat to human health and welfare. The ruling allows EPA to begin regulating GHG emissions from power plants, factories and major industrial polluters. It also, in principle, allows EPA to begin regulating emissions from motor vehicles.

The book *Growing Cooler: The Evidence on Urban Development and Climate Change*, calls for such regulation under the air quality conformity rule.

The obvious and best way for EPA to respond (to the Supreme Court ruling) is to extend transportation conformity requirements from criteria pollutants to GHGs. Under such a system, state and local governments would be required to adopt mobile source GHG emission reduction budgets (like the emissions budgets for other pollutants) that demonstrate reasonable progress in limiting emissions. Currently, regions that fail to develop transportation plans consistent with “reasonable further progress” goals risk curbs on federal transportation funds. Withheld funds could be used to reward states and MPOs that effectively reduce per capita VMT.

Although we acknowledge that, to date, land use and transportation demand management (TDM) policies generally have not played a significant role in meeting regional conformity requirements, we believe that comprehensive strategies aimed at GHG reductions would be more successful and less easily circumvented. Responsibility should be “nested” so that the federal government is responsible for the GHG impacts of federal transportation spending and state and local governments bear responsibility for the GHG impacts of their transportation spending (Ewing et al., 2008).
This best practice requires that metropolitan regions be assigned CO2 budgets for motor vehicle emissions. EPA could establish such budgets based on the need to reduce overall emissions by something like 80 percent below 1990 levels by 2050. Logically, while transportation might not be required to do as much as other sectors to reduce overall emissions, it should be contributing something to the effort under a national plan. Given VMT and VMT per capita data, RTPs do not appear to be doing their fair share to stabilize climate in the long term. This is one conformity requirement that would not be easily met. It could shift funding away from projects that generate additional VMT, namely highway expansion projects.

While this proposed best practice may seem radical, it is essentially what is being done in California under SB 375, the Smart Growth Climate law. Recently, the California Air Resources Board issued greenhouse gas targets to MPOs, targets they will be required to meet through the development of Sustainable Communities Strategies as part of their RTPs.

### Environmental Justice

#### Conventional Practice

Historically, low-income and minority residents faced disproportionately negative impacts from highway projects run through their communities. Further, these residents and communities were excluded from transportation policy-setting or decision-making and so did not receive a fair share of the benefits of transportation investments.

In response to these and other inequities, federal laws, rules, and regulations now promote environmental justice. Environmental justice is defined as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of laws and policies.

The concept of environmental justice is rooted in Title VI of the Civil Rights Act of 1964 which prohibits discriminatory practices in programs and activities receiving federal funds. Title VI bars intentional discrimination, but also bars unjustified disparate impacts on EJ populations.

While the federal metropolitan transportation planning rule makes reference to Title VI (23 CFR 450.334), it provides no guidance on how it is to be applied. The conventional practice of RTPs is to finesse environmental justice issues. Many RTPs make no reference to them at all. Others provide undocumented assurances that positive and negative impacts of transportation projects are distributed in an equitable manner.

SANDAG plans, projects, and programs, including the RTP, comply with the principles of environmental justice and all associated federal and state requirements (San Diego Association of Governments, 2007, p. 5-28).

All projects for the Charlottesville-Albemarle MPO and Thomas Jefferson Planning District are reviewed for environmental justice impacts and must meet high standards for all neighborhoods (Charlottesville Albemarle Metropolitan Planning Organization, 2004, p. 18).

When RTP impacts are quantified, it is often in terms of a simple head count (project count), not in terms of the ultimate impact of projects on low-income and minority communities.

The results are mixed across the various time periods, but for each time period, there are fewer projects in high minority and low-income tracts than a proportionate share. In total, 34 percent of the projects are located in high minority tracts, while only 3.4
percent of the projects are located in low-income tracts. This compares unfavorably to the fact that high minority tracts comprise 59 percent of tracts in the planning area and low-income tracts comprise 13 percent of the census tracts (Indianapolis Metropolitan Planning Organization, 2009, p. 91).

**Best Practice**

There are three fundamental EJ principles:

1. To avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations.
2. To ensure the full and fair participation by all potentially affected communities in the transportation decision-making process.
3. To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations.

The RTPs reviewed contain a number of applications of these principles. The most basic is the quantification of outcomes of plan investments on subareas with concentrations of the low-income and minority residents, and direct comparisons to subareas without such concentrations. In the development of its RTP, the Los Angeles MPO utilized a number of performance measures designed to assess the overall equity of its investments:

- Accessibility (Employment Services and Parks)
- Distribution of Plan Expenditures (Investments)
- Taxes Paid
- Auto Travel Time Savings
- Auto Travel Distance Reductions
- Environmental Impact Analyses (Air Emissions and Noise)

Other exemplary practices include setting aside funds specifically for mobility initiatives in disadvantaged communities, and making extraordinary efforts to engage EJ groups in the planning process. The San Francisco 2035 Plan committed an additional $400 million for transportation options in low-income communities. The MPO’s Lifeline Transportation Program supports projects that address mobility and accessibility needs in low-income communities throughout the region. The Austin MPO, in coordination with the regional Environmental Justice Working Group, conducted two surveys designed to gather EJ community opinions related to transportation. The “Transportation Needs Survey for Environmental Justice Populations in the CAMPO Area” focused on concerns, safety issues and solutions.

![Figure 51: Comparison of Employment Accessibility Improvements by Travel Mode and Income Category (Southern California Association of Governments, 2008, pg. 177)](image-url)
Transportation and Land Use Modeling

Conventional Practice

The long-range transportation planning process relies on forecasts of future travel patterns, which in turn rely on forecasts of future land use patterns since it is the need to go from one land use to another that generates travel. The conventional model structure is shown in the accompanying figure, taken from one of the RTPs. Future land use patterns are sometimes modeled mathematically but more often determined through a process of negotiation among participating governments based on their future land use plans. Future land use patterns are usually some version of trend development, which is usually some version of sprawl since the trend since WW II has been to sprawl.

These future land use forecasts are fed into a conventional four-step travel demand model, which first forecasts how many trips are generated in and attracted to small subareas called traffic analysis zones (trip generation), then forecasts flows among TAZs based on numbers of productions and attractions plus travel time between zone pairs (trip distribution), then splits flows among modes of travel based on demographic factors and relative travel times by alternative modes (mode choice), and then assigns flows to transportation networks such that aggregate travel times are minimized (network assignment).

In trip distribution, the number of trips forecasted to stay within zones disregards land use patterns and street network configurations within zones. In mode choice, walk and bike trips are not forecasted at all, and among motorized trips by auto or transit, mode splits are treated as independent of land use patterns within zones of origin and destination.

Best Practice

Given the importance of land use and travel forecasting in the long-range transportation planning process, surprisingly little is said in RTPs about the analytical tools used to make these forecasts. This discussion therefore extrapolates from what is stated, in light of the literature generally.

You might assume that the best practice would involve modeling future land use patterns objectively rather than relying on the subjective and political process of negotiation among local jurisdictions. This isn’t necessarily the case. Two of the featured MPOs (Dallas-Ft. Worth and Kansas City) use the land-use forecasting tool, DRAM/EMPAL. The forecasting process is described this way in the Kansas City RTP:

DRAM and EMPAL were both calibrated over the 1980 to 1990 period. There were then run successively, with DRAM allocating households based on employment location then EMPAL allocating employment based on household location — to step forward in time to the end of the forecast period, which was originally 2020. The resulting trend forecast was reviewed by MARC’s Technical Forecast Committee for consistency with local plans and adjusted as necessary (Mid-America Regional Council, 2005, p. 2-2).
The problem with this approach, which caused the Kansas City MPO to abandon it, is the following:

While good for forecasting historical trends into the future, the structure of DRAM and EMPAL was not appropriate for assessing how trends might change in response to policy changes like the imposition of impact fees on new development or significant new investments in the region’s urban core. Therefore, the Technical Forecast Committee modified the trend forecast to represent its judgment concerning the likely impact of existing policy and investment initiatives. It was this policy-oriented forecast that was adopted by the MARC Board of Directors for use in transportation planning (Mid-America Regional Council, 2005, p. 2-2).

There appear to be two good alternatives to negotiated forecasts and trend-based model forecasts. One is to use a newer policy-sensitive, behaviorally-oriented land use forecasting models like UrbanSim or PECAS. This is the approach taken in Salt Lake City with UrbanSim and in Baltimore with PECAS:

UrbanSim is a state-of-the-art approach to forecasting future land-use growth with growth forecasts influenced by the quality of the proposed transportation system. By coupling UrbanSim with the regional travel demand model system, a range of land use and transportation policy interventions are combined into policy ‘scenarios’, and the systematic effects of these intervention strategies can be expressed in terms of projected urban development outcomes and the quality of the transportation system (Wasatch Front Regional Council, 2007, p. 39).

Since the early 1990s, the BRTB has sought to fully integrate a land use model with the Baltimore Regional Travel Demand Model. In order to develop such a model, the BRTB has tested numerous software packages and developed databases needed to implement an econometric land use model. The BRTB has chosen to work with the Production Exchange and Consumption Allocation System, or PECAS model, to investigate the link between transportation infrastructure development and the price and movement of commodities and floor-space in the region (Baltimore Regional Transportation Board, 2007, p. 23).

The other approach is to arrive at a normative future land use forecast through a scenario planning process (see above). This is the approach taken in the Sacramento RTP, using the planning support tool I-PLACE3S. The Sacramento MPO describes the approach this way:

The problem with scenario planning is that its technical; without a software tool like I-PLACE3S, scenario planning can be complex and intimidating, and can devolve either into planning by guesswork (with little or no technical information because it is simply too costly and impractical to create), or the
reverse, a simple accounting of numeric data. Like any tool, I-PLACE3S must be used properly to achieve the desired results (Sacramento Area Council of Governments, 2010, p. 1).

The I-PLACE3S model was instrumental in the Blueprint Project from 2002 to 2004, in the development of the Metropolitan Transportation Plan 2035 land use allocations, and continues to be important in the Blueprint implementation efforts at SACOG and several member and partner agencies. SACOG staff and member agencies also use it to develop land use scenarios that feed into travel and air quality modeling (Sacramento Area Council of Governments, undated).

The other area of best practice is in travel demand modeling. The Salt Lake City travel demand model has “several advanced features that place it on the cutting edge of the improved modeling methodology needed to meet the requirements of SAFETEA-LU and the Clean Air Act Amendments of 1990” (Wasatch Front Regional Council, 2007b, p. 111). We are not told what they are, though. The St. Louis model has been given a “major overhaul,” but we are not told what that entailed (East-West Gateway Council of Governments, 2007, p. 4). The Burlington model “incorporates several advanced features” but only one is identified, the ability to forecast detailed mode choices including walk/bike (Chittenden County Metropolitan Planning Organization, 2005, p. 24). The Boston model is “similar in nature to those used in most other large urban areas in North America” but “incorporates many new procedures, including the ability to forecast non-motorized trips” (Boston Region Metropolitan Planning Organization, 2007, p. 3-8). The New York “Best Practices Model” forecasts “journeys” (multiple trip segments) rather than conventional “trips” (New York Metropolitan Transportation Council, 2010, p. 2-6).

While all of the above are doubtless useful innovations, what really distinguishes conventional practice from best practice is the ability to account for the effect of the D variables (density, diversity, design, destination accessibility, and distance to transit) on trip rates, trip distances, and mode choices. In this regard, the best practice may be accomplished either by post-processing outputs of more conventional models, or by developing state-of-the-art micro-simulation models. The Sacramento MPO has done both, as it explains in its RTP.

SACOG has been at the forefront of development and application of travel demand modeling tools, and throughout the Blueprint project SACOG worked to improve the ability to capture land use and transportation interrelationships using computer models. SACOG currently maintains two regional travel demand forecasting models: the Sacramento Regional Travel Demand Model (SACMET), and the Sacramento Regional Activity-Based Simulation Model (SACSIM). SACMET plus 4Ds post processing has been used for regional travel forecasts for the MTP workshops. At this point in its development, it is believed that SACSIM may be slightly less sensitive to some 4D’s land use factors than is SACMET plus 4Ds, which results in the more conservative SACSIM forecasts (Sacramento Area Council of Governments, 2007, p. 46).

Beyond the analytical tools that are used, another best practice involves the assumptions that are made about the distant future. All plans look forward at least 20 years, and many look forward 30 years or more. Odds are that peak oil will be reached by then, and that devastating impacts of climate change will have forced world governments to take strong action to curtail greenhouse gas emissions. Some future scenarios should relate to the very
different world we will inherit. One RTP that at least nods to the possibility is Los Angeles':

Travel demand forecasts generally assume that the future will include an abundant and relatively inexpensive supply of transportation fuels. If transportation fuel prices continue to increase, it would have a ripple effect on numerous areas including construction costs, gas tax revenue, travel and aviation demand, air emissions, mode choice and growth patterns. One area of uncertainty is how commuters may respond to higher gasoline prices. For example, a recent study suggests that with a ten percent increase in the gas price, there is a less than one percent change in gas consumption, while other data show that an increase in gas prices coincides with an increase in transit ridership (Southern California Association of Governments, 2008, p. 15).

Public Involvement

Conventional Practice

The Federal Highway Administration describes the conventional practice of public involvement as an example of what not to do. “Public participation is more than just a hearing, or one meeting near the end of the project development process.” Per federal requirements, most MPOs now prepare elaborate public participation plans. They often fill an entire chapter or appendix of the RTP. It is hard to find examples of large MPOs that do only the bare minimum required by federal regulations. One MPO that seems to, based on its own public process description, is the Indianapolis MPO:

Key components of the public involvement program are the MPO newsletters and the MPO web site. The MPO staff presented the 2030 RTP 2009 Update process to the IRTC, as well as the subsequent draft list of cost-feasible projects. The 2030 RTP 2009 Update was also made available to the public during a public comment period where the Update was available at numerous public locations including libraries... The public review period as well as all public hearings is advertised on the MPO’s website, in local newspapers, and at local libraries (Indianapolis Metropolitan Planning Organization, 2009, p. 11).

Best Practice

It is clear from the review of RTPs that some MPOs take public participation more seriously than others. One of the Boise RTP’s four goals is to “dispense better information.” Its objectives include: “develop innovative methods to involve the public in transportation planning” and “promote dialogue about land use and transportation throughout the region” (Community Planning Association of Southwest Idaho, 2006, p. 47). Generalizing across RTPs that are more engaging, the elements of best practice include:

(1) Early and Continuous

The Boise process came in four distinct, thematic phases, from initial vision and scenario development to final plan review and approval. Ultimately, hundreds of people participated in workshops, cafés and presentations during the first three phases of the process. The fourth phase was particularly creative. Rather than presenting the RTP in a traditional open house or public hearing setting, residents hosted dozens of meetings with their friends, peers and/or colleagues to review and discuss the plan (Community Planning Association of Southwest Idaho, 2006, p. 28).
(2) Intensive and In-Depth
Rather than one-time affairs like public meetings or open houses, committees can be charged with ongoing responsibility for different aspects of the RTP. The New York MPO maintains a number of advisory working groups to act as conduits for information from the interested public on specific aspects of the transportation planning process. These groups have been established in policy areas such as freight planning, demand management and mobility, and pedestrian and bicycle transportation (New York Metropolitan Transportation Council, 2010, p. 8-8).

(3) Rich with Relevant Information
Participants in the Sacramento process were provided maps of nine transportation corridors and performance information from computer modeling associated with specific transportation investment packages. The performance indicators included vehicle miles traveled in congestion, vehicle hours of travel per household, and percentage of trips driving alone, carpooling, walking, bicycling, and using transit by 2035 (Sacramento Area Council of Governments, 2008, p. 86).

(4) Varied in Format
The Minneapolis-St. Paul process used all of the following: forums, including on-line forums; workshops; special events; open houses; conferences; focus groups; key person interviews; and civic and community meetings (Minneapolis-St. Paul Metropolitan Council, 2009, p. C-12).

(5) High Tech and High Touch
To engage a generation that relies on and is most comfortable with the Internet for information, a high tech approach was developed in Austin that included: a website with the ability to send e-blasts about community meetings; online surveys to identify overall priorities, preferences and prioritization of projects; use of social media outlets that included Twitter, Facebook, and YouTube. For those without access to or an aptitude with the Internet, high touch techniques encouraged interested parties to become engaged in the process through: community workshops that introduced the planning process and solicited feedback with interactive mapping exercises; targeted outreach, specifically to environmental justice populations; display booths staffed by public involvement team members and MPO staff members to answer questions in a one-on-one format (Capital Area Metropolitan Planning Organization of Austin, 2010, p. 10).
NEWS RELEASE

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That’s the essence of an important series of public town hall forums slated for December 3-9 in four locations around Clinton, Eaton and Ingham counties as the Tri-County Regional Planning Commission begins to update the region’s transportation plan to 2035.

For More Information:
Contact: Jon Coleman, Executive Director

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References


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