Are They Ready?

Mega-Region Growth and Transportation Investment

By

David T. Hartgen, Ph.D., P.E.
M. Gregory Fields
Claire G. Chadwick

The Hartgen Group
8711 High Ridge Lane
Concord, NC 28027
www.hartgengroup.net

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A Report
To the

Urban Land Institute
Robert Dunphy, Project Coordinator
1025 Thomas Jefferson Street, N.W., Suite 500 West
Washington, DC 20007-5201
www.uli.org

Contents

Executive Summary

Commuters stewing in traffic do not understand why even simple transportation improvements take years and larger ones take decades. This report summarizes a recent study of the transportation plans of 22 US large urban areas conducted for the Urban Land Institute, a Washington DC research organization. The study's goal is to assess the readiness of large urban regions to accommodate growth. The study assesses the nature of growth, reviews transportation plans and identifies major initiatives to address growth. Twenty-two regions are studied, including most over 2 million persons.

The regions are predicting an average of 39 percent increase in population and a 51 percent increase in highway traffic over 25 years. Growth rates vary widely by region and location, with suburban and fringe areas predicted to grow fastest. Mid-term (3-6 year) planned expenditures to meet this growth total about **$ 203.5 B**, and long-range planned expenditures total $ **1.304 T**, in current dollars. On average, the regions propose spending about $ **363** per capita annually (2004 dollars) for mid-term improvements, but accelerating this to **$ 441** per-capita annually for long-term improvements.

Regional transportation plans are structured primarily to meet federal regulations. Federal funding programs largely 'lock in' modal funding shares. Plans are strangely unsatisfying documents, downplaying predicted traffic growth. Shares of transit money average 32 percent of mid-term and 41 percent of long range plan budgets, about 7 times the average share of transit commuting, 5.5%. Transit per-capita expenditures are predicted to rise about **45** percent. Transit funding sources are generally in place and major initiatives are identified. But highway shares of funding are predicted to decline from 63 to 57 percent of budgets, and per-capita highway expenditures are expected to increase just **8** percent. Most plans also assume significant shift of commuters to 'managed' (priced) lanes, carpool or to transit. Most major highway expansions are for priced or managed lanes. This could create 'second class' commuters unable to afford regular use. Public-private partnerships are mostly for managed lanes, toll roads or similar, which would not deal with the majority of present traffic or its growth and might increase local traffic. Cost increases and community opposition often mean construction delays for major highway projects. Recapitalization and preservation costs are likely understated. But even with plans, traffic congestion is expected to worsen significantly in most regions, resulting in higher commuting costs. Although some states have initiated reviews of transportation needs, only two (Texas and Georgia) have set congestion reduction goals. In short, highway planning is on a collision course with traffic growth.

Plans also suffer from 'mission creep', struggling to serve many objectives. All regions predict that air quality will improve sharply, primarily through fleet turnover. Most plans have no vision for inter-regional access and may be too small geographically. Plans seem to come up short as policy documents and have become regulatory-driven mechanisms for continuation of modal funding. If they were 'business plans,' most would be rejected as impractical or perhaps even naïve.

Plans should be more realistic about growth and focus more on transportation issues such as congestion, safety, accessibility, mobility and economic impacts. Citizens and governments should demand more realistic planning and agency accountability. If we are going to spend over a trillion dollars for transportation, we should get significant improvement in the performance of transportation systems.

I. Introduction

This report summarizes a recent review of the transportation plans of 22 US large urbanized areas, initiated by the Urban Land Institute in November 2007. The review is intended as a high-level summary of the status of transportation plans for the largest US urban regions.

A. Issues:

Are the largest US urban regions prepared to accommodate predicted population growth and repair and expansion costs for their transportation infrastructure over the next 25 years? The Urban Land Institute has initiated a review of this important question by calling for a study to determine the state of readiness of these regions to address future transportation infrastructure needs. The goals of the study are to:

1. *Determine the current condition* of transportation systems in large US regions.
2. *Assess the amount and patterns of growth.*
3. *Determine how regional plans support future growth.*
4. *Identify major initiatives* (major projects and other programs) that address challenges posed by growth.

B. Method

The study uses a straightforward approach, with the following steps:

1. **Select Regions.** Study constraints did not permit full review of all regions. The 22 selected regions include most over 2 million population and others for comparison.

US Urbanized Areas > 1 Million Population (Selected for this Study)

Region[3] by 2003 Urbanized Area Pop	State	Urbanized Area Population[1], 2003, K	Urbanized Area Population[2], 2030, K	Percent Change, 2003-2030
Population > 5 M				
New York-New Jersey-Connecticut	NY	17717	21295	20.2
Los Angeles	CA	12520	15652	25.0
Chicago	IL	7702	9522	23.6
Philadelphia	PA	5287	5879	11.2
Miami-Broward-Palm Beach	FL	5104	7551	48.0
2 M < Population < 5 M				
Dallas-Fort Worth	TX	4312	7014	62.7
Washington	DC	4277	5973	39.7

[1] Source: Federal Highway Administration, Highway Statistics 2003, USDOT, 2004.

[2] Source; Hartgen DT and Fields MG, Building Roads to Increase Capacity, Reason Foundation, Los Angeles, CA, 2006.

[3] The NY region includes northern NJ and southwestern CT. The Miami region includes Broward and Palm Beach Counties. In each of these cases, data from the three sub-regions are consolidated. For several other regions, however (Chicago, Philadelphia, Portland and Tampa), data for nearby much smaller urbanized areas are NOT included. The effect is to understate population and expenditures for these other regions.

		Urbanized Area Population[1], 2003, K	Urbanized Area Population[2], 2030, K	Percent Change, 2003-2030
Region[3] by 2003 Urbanized Area Pop	**State**	**2003**	**2030**	**2003-30**
San Francisco-Oakland	CA	4120	4968	20.6
Boston	MA	3988	4636	16.3
Detroit	MI	3939	4277	8.6
Seattle	WA	2946	3963	34.5
Atlanta	GA	2924	5009	71.3
Phoenix	AZ	2907	5313	82.7
San Diego	CA	2872	3720	29.5
Houston	TX	2620	3987	52.2
Minneapolis-St. Paul	MN	2482	3370	35.8
Baltimore	MD	2076	2437	17.4
St. Louis	MO	2067	2324	12.4
Tampa	FL	2057	2863	39.2
Denver-Aurora	CO	2050	3210	56.6
1 M < Population < 2 M				
Pittsburgh	PA	1793	1630	-9.1
Cleveland	OH	1792	1792	0
Portland	OR	1685	2513	49.1
Riverside-San Bernardino	CA	1666	2629	57.8
San Jose	CA	1664	2036	22.4
Sacramento	CA	1656	2488	50.2
Cincinnati	OH	1606	1890	17.7
Virginia Beach	VA	1536	1794	16.8
Kansas City	MO	1434	1859	29.6
Milwaukee	WI	1356	1460	7.7
San Antonio	TX	1333	1963	47.3
Orlando	FL	1267	2112	66.7
Providence	RI	1218	1411	15.8
Columbus	OH	1195	1572	31.5
Buffalo	NY	1123	1011	-10.0
New Orleans	LA	1009	1053	4.4

2. **Gather Data. R**eviewing published documents, determine the current status of transportation facilities and long range transportation plans. Documents include recent federal transit and highway data, congestion statistics, visions long range plans (LRPs), transportation improvement programs (TIPs), congestion management plans, air quality determinations and others.

3. **Describe Growth Patterns.** For each region, describe predicted growth by ring (central city/county, inner suburban, suburban fringe, and rural/exurban).

4. **Identify Major Initiatives.** Contact each region concerning major funding or organizational initiatives and large transportation projects underway or planned.

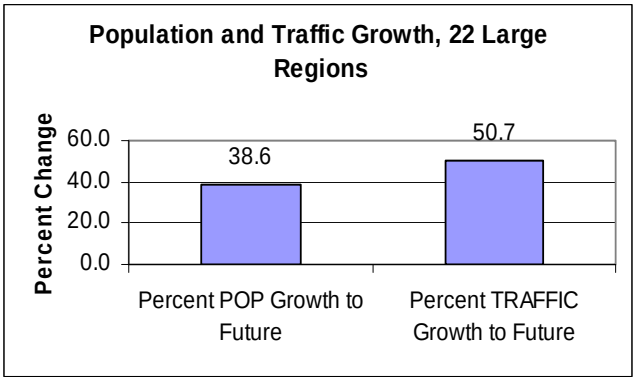
5. **Report.** Prepare a short interim report and a final report summarizing findings. Assess how ready America's largest regions areas are to deal with transportation needs. Identify common themes and practices.

II. Findings

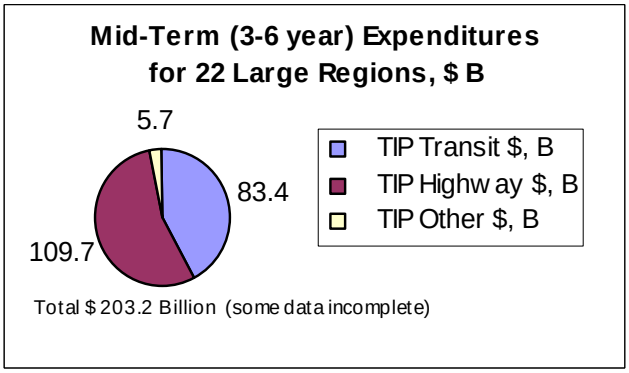
A. Summary

The following are the primary observations from our scan of the transportation plans of 22 large urbanized areas. The attached summary table provides more detail concerning each region; a detailed region-by-region document is published separately.

- The 22 regions collectively contain about 107.7 million persons, about 1/3 of the US total. They are predicting, on average, a 39 percent increase in population and a 51 percent increase in highway traffic[4] over their 25-year forecast horizons. Growth will be relatively fastest in suburbs and fringes of regions, but also numerically substantial in urban core areas.

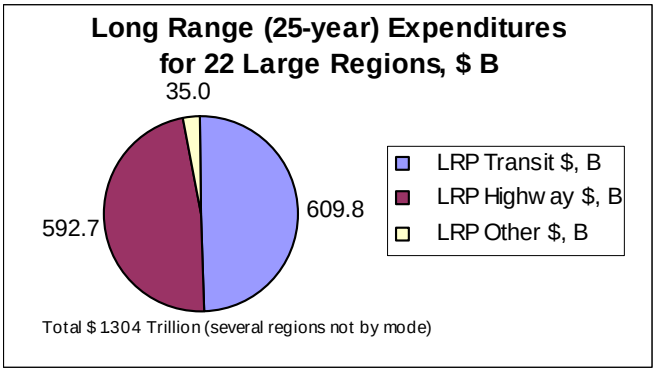


- For these 22 regions, mid-term planned transportation expenditures are estimated at about **$** 20**3.2 B** over an average of 4.8 years.

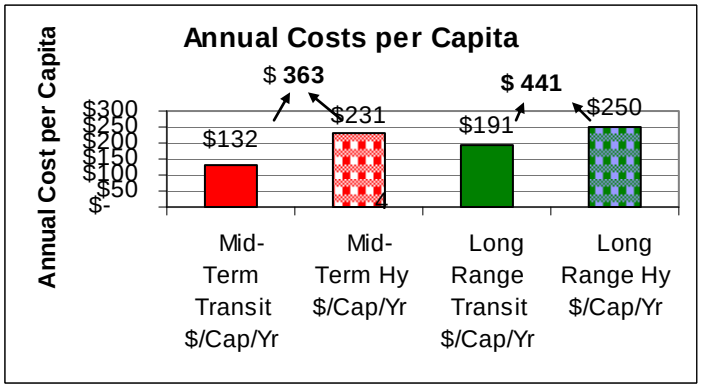


- Long range (25-year) transportation plans propose to spend about $ 1.30**4** trillion, in current dollars.

[4] The standard measure of traffic in urban transportation planning is the *vehicle-mile* (vehicle-mile-of-travel, VMT), defined as one vehicle traveling one mile. Average VMT in most regions is about 30 per person per day.



- On average, plans propose spending about **$ 363** per person per year over the mid-term (3-6 years), and $ 441 per person per year (2004 dollars) over the longer term (25 years) for highway and transit improvements.



This is about $ 1000/household, or about 1/8th of the average household expenditures for transportation[5].

- Mid-term expenditures for transit average about 32 percent of budgets, and highway funds average about 63 percent of budgets. Other expenditures (bike/pedestrian, air quality, ports, etc) account for 4.3 percent.

- Within each region, one or more 'metropolitan planning organizations' (MPOs) are responsible for transportation planning[6]. Both mid-term and long range transportation plans are structured to address federal regulations, and are required

[5] US Dept. of Labor, Bureau of Labor Statistics, Consumer Expenditures in 2005, February 2007. By far the largest part of transportation costs for most households are the costs of owning private vehicles, yet transportation plans generally do not consider most personal auto use costs (vehicle capital and repair, insurance, etc) in their calculations. Classic transportation comparisons include the value of user travel time, fares, parking, vehicle operating costs and accident costs, but not private vehicle capital costs. Public vehicle capital costs are is generally included, as are transit operating costs.

[6] "Metropolitan Planning Organizations" are federally mandated transportation planning agencies responsible for preparing transportation plans for urbanized areas with more than 50,000 persons. They consist of appointed and elected representatives of jurisdictions and transportation agencies.

to be 'fiscally constrained', balancing likely revenues with planned expenditures. Nevertheless, many plans appear to be informally over-programmed since they typically assume that *more* federal, state and local funds will be forthcoming, often place major projects in the out-years, understate recapitalization costs, and (until recently) ignore inflation. This sometimes leads to 'project mirage', the ever-distant unaffordable major project.

- The plans increase long range transit expenditures, compared with the mid-term future. **Average per-year transit spending is predicted to increase about 67 percent, from $ 760 million to $1.27 billion,** and annual *per capita* transit spending is predicted to increase about **45** percent, from $ 132 to $ 191, in the long term compared with mid-term, about the same as traffic growth. **But average per-year highway spending is planned to increase about 16 percent, from 1.031 B to $ 1.194 B.** Annual *per capita* highway spending is predicted to increase just **8** percent, from $ 230 to 250, slower than population or traffic growth.

- In long range plans, transit expenditures are slightly more than ½ of the aggregate expenditures, about $ 610 B. Transit expenditures average about 41 percent of budgets, about 7 times the share of transit commuting, averaging 5.5%. Transit funding sources for operation and capital are generally in place, major initiatives are identified, and community support is generally positive. Most plans provide expanded transit capacity intended to tie ring growth to the region's core. However, generally minor changes are expected in transit's share of travel. In spite of forecasts of minor mode shifts, most plans put intense focus on changing travel behavior rather than on accommodating the growth of highway traffic. In a few cases, larger shifts are predicted.

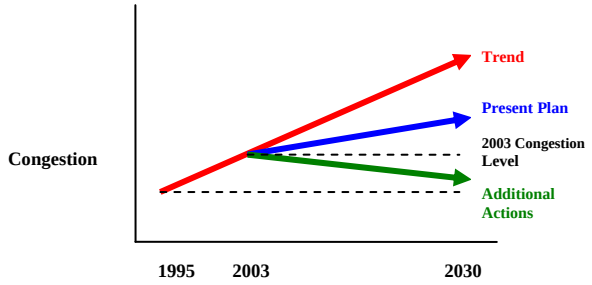
- Long range plans for highway needs (particularly those dealing with additional capacity and repairs) seem less adequate. Total highway expenditures are estimated at $ 593 B, slightly less than transit expenditures. Long range highway expenditures average about 57 percent of budgets, down from 63 percent in mid-term plans. But most plans seem to understate recapitalization and preservation needs. And particularly regarding congestion, most plans assume shifts of behavior within the highway mode, particularly solo drivers moving from congested to 'priced'[7] lanes. Many of the highway expansions are for priced or managed lanes.

- Even with such shifts, 18 of 21 plans forecast that congestion will worsen even with investments, implying that even more actions would be needed to reverse worsening congestion trends. Future highway congestion (delay, miles congested, etc) is expected to *double* in most regions, more than that in suburban areas. With just three exceptions (San Diego, Milwaukee and Seattle) the plans predict an

[7] 'Priced' (managed) lanes are (generally freeway) lanes on which only certain classes of vehicles are permitted, some for a fee or toll, which may vary by congestion level or time of day.

increasing 'congestion gap' and seem to fall considerably short of dealing realistically with anticipated highway traffic growth.

Long Range Plan 'Congestion Gap'



(Two of the exceptions, Seattle and San Diego, predict large and in our view unlikely shifts in travel behavior). This policy may create a 'second class' commuting population unable to afford regular use of managed lanes. Second-order impacts may include consumer and business inefficiency, more rapid regional spread, increased fuel use and economic stagnation. Most plans do not show the impact of their investments on traffic growth. Most plans would hardly even slow the growth of congestion, let alone reverse it. While there are obviously many transportation goals other than congestion that need attention, this shortcoming is significant.

- The plans also generally do not address adequately the *physical* condition of the system. Although plans identify funds by functional category (maintenance and operation , preservation, capital, expansion, etc) only three plans reported data on condition and only one region (New York-NJ-CT) reported forecasting road and bridge conditions. The plans contain some discussion of the need to recapitalize existing roads and transit, and many reserve significant funds for maintenance and preservation, but these needs seem to be lagging behind capital expansion.

- Several additional factors are likely to exacerbate these problems. Declining real expenditures (caused by rapid inflation in the construction industry[8]) and increasing fuel-efficiency standards that will slow the growth of fuel use revenues mean that the growth of highway-fund dollars is not likely to match the projected 51-percent traffic growth. Although there will be diversion of some road traffic to transit, carpool and managed lanes, this shift will likely account for no more than 2-to-4 percentage points of the 51-point growth. And although various 'private-public-partnership' initiatives are likely to add some capacity on major links, they will probably not significantly address the growth in overall travel or provide capacity on the urban arterial system.

[8] Semmens J. Price Trends for Major Roadway Highway Inputs, Arizona Transportation Research Center, January 2008. Overall highway construction price increases for 1 year are 10%, 5 years 51%, and 10 years 62%.

- In short, highway funding appears to be on a collision course with traffic growth, resulting in a future characterized by ineffective shifts in modal shares, higher household commuting costs, less than adequate highway capacity, significantly higher congestion and economic stagnation.

- Several states (e.g. CO, WA, AZ, TX, PA, CA, FL, and GA) have initiated state-level reviews of transportation needs or congestion-reduction assessments and others have called for it. Each region has a 'congestion management plan' specifying how it plans to deal with congestion. But only two states (TX and GA) have taken actions to set congestion *reduction* goals and begin to develop plans to achieve them.

- Regional transportation plans are strangely unsatisfying documents, generally ignoring or downplaying their own forecasts of oncoming growth. In a few regions (e.g. Dallas-Fort Worth, St. Louis) plans are largely realistic but still seem to fall short of anticipated traffic growth; in most others (e.g. Seattle, San Diego) the shifts of behavior needed to address growth would be massive and in our view are not likely. If these plans were 'business plans', most would be rejected as impractical or perhaps even naïve.

- Transportation plans also suffer from 'mission creep'. Initially intended to provide for transportation access and mobility, they are now expected to improve the quality of life, reduce air pollution, foster economic development, and improve societal circumstances.

- Federal funding programs, particularly those reserving a fixed share of federal gas taxes for major transit investments, seem to effectively 'lock in' modal funding shares. The plans allocate what funding is thought to be available, not what the regions need. The big decisions on transit and road funding shares are made up front, so cost effective solutions may lose out to sub-optimal regional decisions.

- Public-private partnerships are often mentioned as a component of regional plans, and in most plans they appear to be the primary means of expanding highway capacity. But these actions are mostly for high-occupancy-toll[9] (HOT) lanes, priced or managed lanes, toll roads or similar. In most cases they would not deal with the majority of present traffic or its growth and might actually increase local traffic pushed off priced facilities. Transit PPPs ('PentaP'[10] projects) are beginning to get attention.

- Two regions (NYC and San Francisco) are actively planning downtown auto-pricing zones. Three (Portland, Seattle and Denver) have or are planning urban growth boundaries.

[9] A "HOT" lane, high-occupancy-toll, permits both multiple-passenger and solo-driver vehicles to use it, the latter with a toll or other payment.

[10] "Public Private Partnership Pilot Program", USDOT's response to Sect 3011 of SAFETY-LU. Five projects have been identified: Denver, Miami, Minneapolis, SF (BART), Washington DC (Largo Ext.).

- With just a few exceptions, the plans contain no visions for inter-regional or inter-state connectivity. Even the needs or impacts of nearby regions get short shrift.

- All plans predict that air quality will improve sharply. This is in spite of the content of plans, since the improvement is caused primarily by fleet turnover. There is very little talk (in the plans) of climate change or global warming, and CO_2 has not yet been analyzed in the plans. But many regions and states are beginning assessments. If CO2 emissions are proportional to fuel use and U-shaped with respect to speed, the forecasts may be for a declining share of emissions from transportation sector over time and improvement if speeds rise.[11], and possible declining total emissions. Recent legislation increasing fuel efficiency standards has also not been analyzed but is likely to improve air quality even faster and also slow the growth of fuel use and fuel-based revenues.

- Comparing the transit and highway situations, the following table summarizes the primary strengths and weaknesses of the plans. On the transit side, funding is generally in place, initiatives are identified, and community support is positive. But capital and operating costs continue to rise and ridership estimates are often below expectations[12]. Transit services for suburbs are difficult to provide efficiently. And the recapitalization of recent major transit investments is generally not mentioned. On the highway side, the programs have a long history of cooperative funding, new initiatives for pricing and PPPs are being proposed, and a large 'base' of commuters depends on adequate capacity. But local and state funds are less certain and capacity investments lag behind growth, recapitalization costs are increasing, there are few general-purpose initiatives under consideration, and a 'congestion coalition' has not gelled.

Summary of Strengths and Weaknesses

Transit Plans	Highway Plans
Strengths: • $ in place, Ave. 40% • Initiatives identified • Community support	**Strengths**: • History of government cooperation • Pricing/PPP initiatives beginning • 95+% of commuters use roads
Weaknesses • Costs understated • Ridership overstated • Growth in suburbs is difficult to serve • Recapitalization not included	**Weaknesses** • Local and state funds less certain • Rapid growth where capacity is lowest • No 'congestion coalition'/resistance • Repair and re-cap costs large • Few general-use initiatives

[11] CO2 emissions are a function largely of vehicle speed: below and above 45 mph, emissions per mile rise. As fuel use per mile declines, most emissions rates also decline.

[12] At the 2008 Annual TRB meeting, FTA presentations indicated that, on average, ridership was 25% overestimated, and costs 40% underestimated for 21 new transit starts since 1990.

- In short, transportation plans seem to be falling short of their basic purpose to chart and provide adequately for future transportation needs. On the transit side, plans need to be more realistic about the likelihood of likely behavioral shifts, weighed against rising capital and operating costs. On the highway side, plans need to focus more on the expected wave of growth which cannot possibly be managed by presently outlined strategies, *and* pay attention to increasing preservation/repair responsibilities. New mechanisms for prioritizing needs, funding sources, and efficient project selection will have to be found[13]. Plans need to be more realistic and focus more on transportation issues such as congestion and accessibility. Citizens and governments expect realistic planning and agency accountability. If we are going to spend over a trillion dollars for transportation actions, we should get measurable and significant improvements in major issues like congestion, safety and condition; this is not likely with most present plans.

B. Growth Trends

Growth trends are those relating to the background trends for population and traffic, modal shares, congestion and system condition.

- The geographic areas covered by the regional transportation plans consist of central counties and surrounding suburban and fringe rural counties. In most cases these regions are geographically separate from others, but several regions in the study group (LA/San Diego, Philadelphia/Wilmington, Chicago/Gary, Portland/Vancouver, New York/NJ/CT, Miami/Broward/Palm Beach, Tampa/St. Petersburg, Washington/Baltimore) are *de facto* 'pairs' of larger regions. Most plans do not have substantial discussion about neighboring regions that interact with them. Even in stand-alone regions, the rapid growth of rural and fringe areas (even though that growth is relatively small) suggests that regional plan geographies may be too small. Ironically, the completion of radial freeways and Interstates largely permitted this long-distance commuting[14].

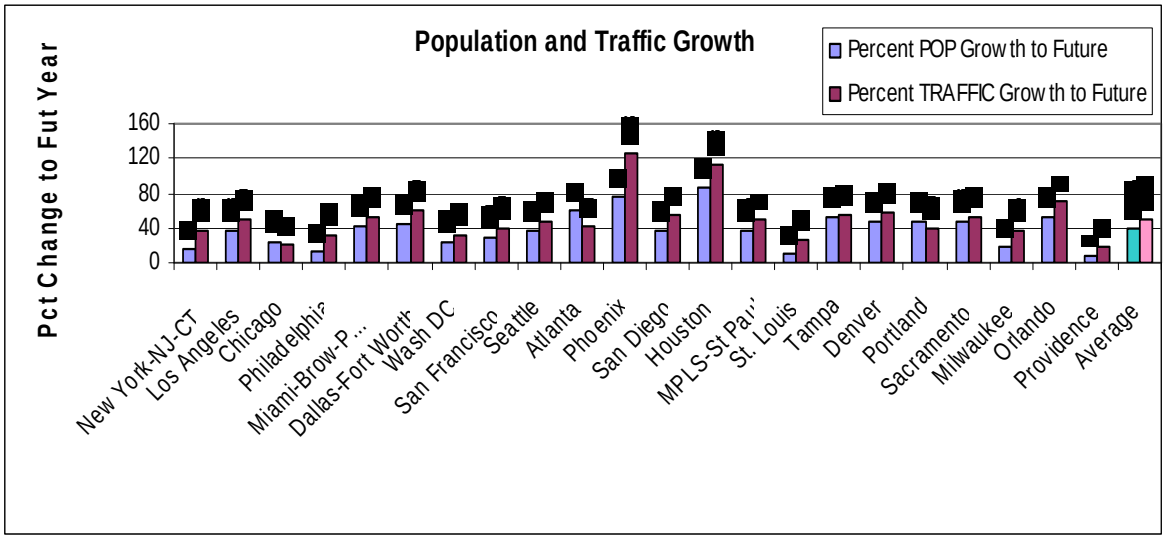
- Three regions (Portland, Seattle and Denver) have or propose urban growth boundaries. Most regions foresee continuation of regional spread, but also increasing population and employment densities within cores.

- On average, the 22 regions are predicting a 39 percent increase in population and a 51 percent increase in traffic over the next 25 years[15].

[13] The recent (January 15, 2008) report of the National Transportation Policy Commission, suggesting increased fuel taxes but also restructuring around outcomes including a 20 percent congestion reduction in large metropolitan regions (http://www.transportationfortomorrow.org) is the first of several expected to outline this dialogue.

[14] Alan Pisarski. Commuting in America III, Transportation Research Board, Washington DC, 2007.

[15] In the following graphics, regions are shown in order of 2003 urbanized area population.

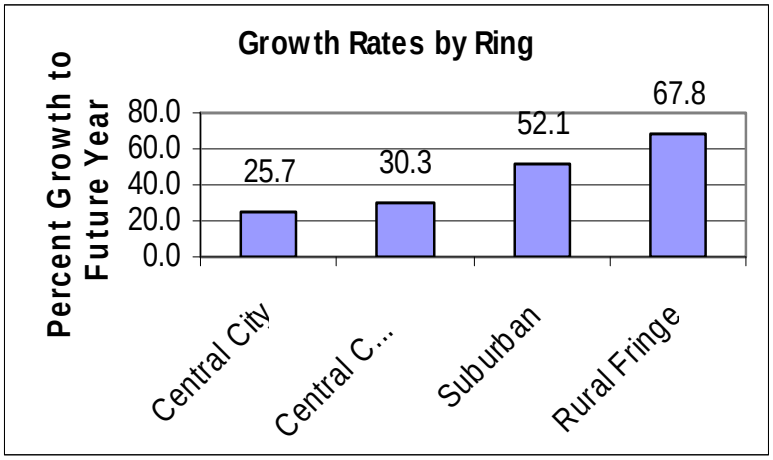


For most regions, traffic growth is generally 30-50 percent faster than population growth, a slow-down in contrast to prior years when traffic growth exceeded population growth by 3-to-1.

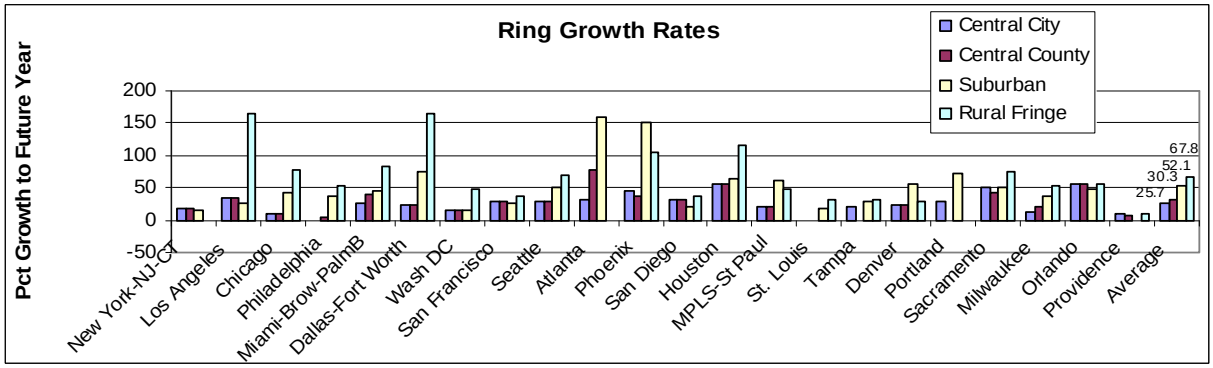
- Population growth over 25 years range from a low of 8 percent for Providence to a high of 87 percent for Houston. Providence, St. Louis, Philadelphia, Milwaukee and NYC all foresee population growth less than 20 percent, although sub-regions within these areas will grow more rapidly. "Average' growth rates (20-50 percent) are foreseen by LA, Chicago, Miami, Dallas, DC, San Francisco, Seattle, San Diego, Minneapolis, Denver, Portland, and Sacramento. Growth rates above 50 percent are predicted by Atlanta, Phoenix, Houston, Tampa and Orlando. Two regions (Phoenix and Houston) expect traffic to grow by more than 100%. Generally, the larger regions are predicting slower growth than slightly smaller regions. Northeast and Central regions are growing slower than South, Southwest or Western regions. Three regions (Chicago, Atlanta, and Portland) forecast less traffic growth than population growth[16].

- Most regions predict that their suburban and fringe areas will grow faster than the inner areas, even though most also predict that inner-area densities will substantially increase. The average predicted population growth for central cities is about 26%, the remainder of the central county about 3**0**%, suburban areas 52%, and fringe areas about 6**8**%. In absolute terms, central county and suburban growth will be considerably larger. If the predicted inner-ring densities do not materialize, traffic growth in outer rings could be even faster. Therefore the most rapid growth is likely to be in precisely the areas that have the most limited highway capacity and transit service.

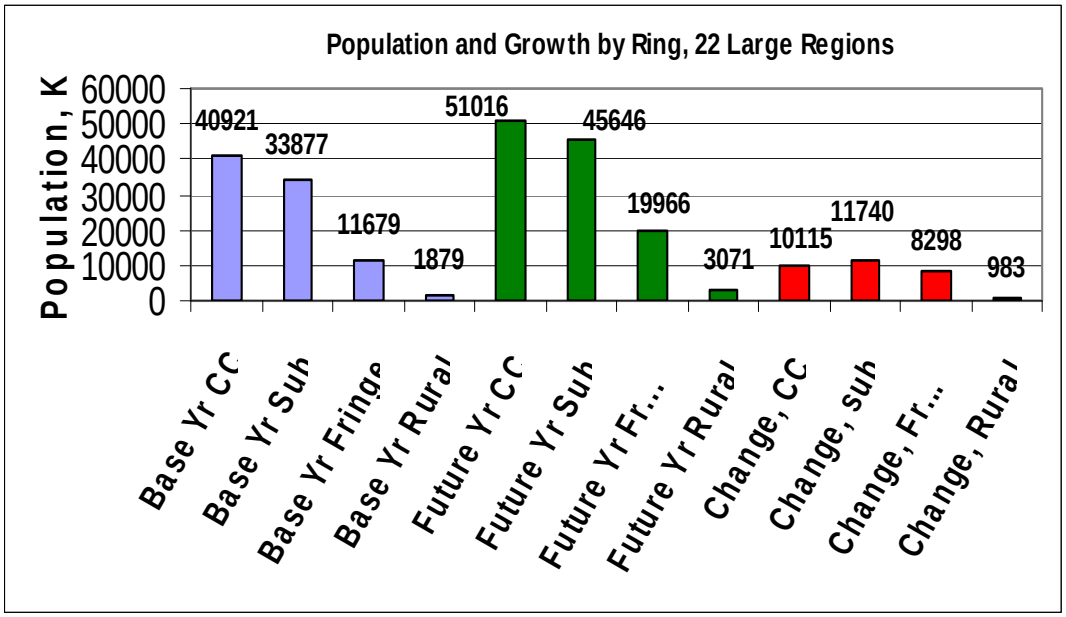
[16] These appear to not be statistical anomalies but rather reflect assumptions of slowing traffic growth.



- Suburban/fringe growth rates are predicted to be over 100 percent for Dallas-Fort Worth, Atlanta, Los Angeles and Phoenix. On the other hand, Providence, St. Louis, Denver and San Francisco foresee suburban growth rates less than 50 percent.



- In absolute terms, these 22 regions are expected to grow by about 31 million persons over 25 years. The largest absolute growth, 11.7 million, will be in suburban counties. The average regional 'suburban' growth will be about 606,000, the average 'fringe' growth about 461,000, and the average 'central city' growth about 527,000. While rural growth rates are high, their relative numbers will remain smaller.

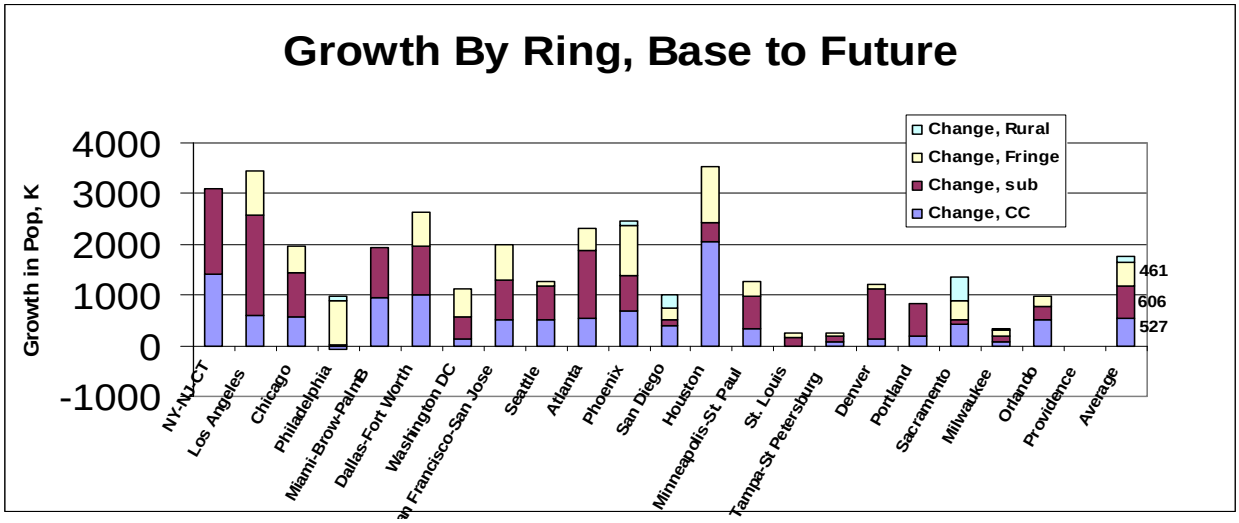


- Most regions predict growth in both inner and outer rings[17]. Differences in definitions of rings makes strict comparisons difficult, but interestingly most 'larger' regions are continuing to predict fringe and suburban spread, while most 'smaller' regions seem to predict that most growth will be near the core. NY, LA, Chicago, and Dallas-Fort Worth follow this pattern, while in the Miami-Broward-Palm Beach region most growth is predicted to be urban and suburban. Several regions (Seattle, San Diego) show the effects of geographic constraints, and some (St. Louis, Providence, Milwaukee, Philadelphia) predict overall relatively slower growth.

- Predictions about the location of growth within a region are based largely on forecasts from regional growth models. These models typically begin with regional growth 'control totals' (population, households, employment by type), provided by external assessments of the region's competitiveness along with migration and birth-death rates. The growth control totals are then allocated to sub-regional geographies (counties and municipalities), then further allocated to even smaller districts using share models that include accessibility (primarily the future highway network), land value, land availability and density allowances. The key hidden assumption in most regional forecasts is that the population and employment density of inner rings will increase. This has proven more difficult to achieve in practice than in models, as housing and employment location preferences evolve. But even assuming increasing inner-ring densities, the predicted fast growth of outer rings is remarkable. And if central-area densities do not rise as predicted, then outer-ring growth might be even faster than predicted, or overall regional growth might be slowed. We believe that these models contain

[17] Growth 'locations' within regions are based on our judgment concerning ring characteristics and data reported by each region, and are therefore not wholly consistent across regions.

considerable 'booster bias' that essentially hopes for both overall growth and rising inner-ring densities, and therefore generally underestimates suburban and fringe growth. This leads, of course, to an underestimate of suburban congestion.



- A number of regions have conducted 'scenario' assessments looking at alternative future growth patterns and their impact on travel. But alternative growth scenarios typically yield only slightly lower VMT forecasts than 'trend' forecasts. Bartholomew[18] has conveniently summarized these studies, from which the following table is extracted. It shows that alternative growth scenarios averaged about -2.3% reduction in traffic versus the trend prediction, ranging from a low of – 14% for San Diego to a high of + 1.4% for DC. In other words, alternative land use plans would not significantly offset the predicted growth in travel.

'Scenario' Forecasts of Traffic

Region	**Scenario Project**	**Scenario VMT Change from Trend**
Washington	Alternative Land Use Scenarios	+1.4%
Philadelphia	What-If Transportation Scenarios	-1.0%
Minneapolis-St. Paul	Two Roads Diverge	-2.0%
Orlando	Community Connections	-2.1%
Median	**All 31 Cities in Assessment**	**-2.3%**
Phoenix	MAG RTP	-2.4%

[18] Bartholomew, Keith. Land Use Scenario Planning, paper in press, *Transportation*, Springer Publications, 2007.

Seattle	Puget Sound Vision 2020	-3.3%
Dallas	Urban Form Options	-4.1%
San Francisco	Livability Footprint Project	-4.7%
Atlanta	Northern Sub-Area Study	-5.8%
San Francisco	Regional Alliance for Transit	-6.1%
Los Angeles	Southern California Compass	-7.0%
Portland	Region 2040	-7.3%
Denver	Metro Vision 2020	-10.0%
Minneapolis-St. Paul	Blueprint 2030	-11.5%
Portland	LUTRAQ	-13.0%
San Diego	Region 2020	-14.1%

- Most of the plans we reviewed did not, in our view, deal adequately with *nearby regions.* The 'planning region' was essentially viewed as a turtle shell beyond which growth was unknown or irrelevant. In several cases (Miami-Broward-Palm Beach, NYC-NJ-CT, San Diego-LA, Tampa-St Petersburg, Chicago-Gary IN, Washington-Baltimore, Portland-Vancouver) the presence of the other 'portion' of the region is essentially ignored in each sub-region's plan[19]. The result is a strangely limiting and probably understated view of growth and long-distance commuting. In some cases, particularly those in which several MPOs share transportation planning, the 'region' is too small for modeling purposes.

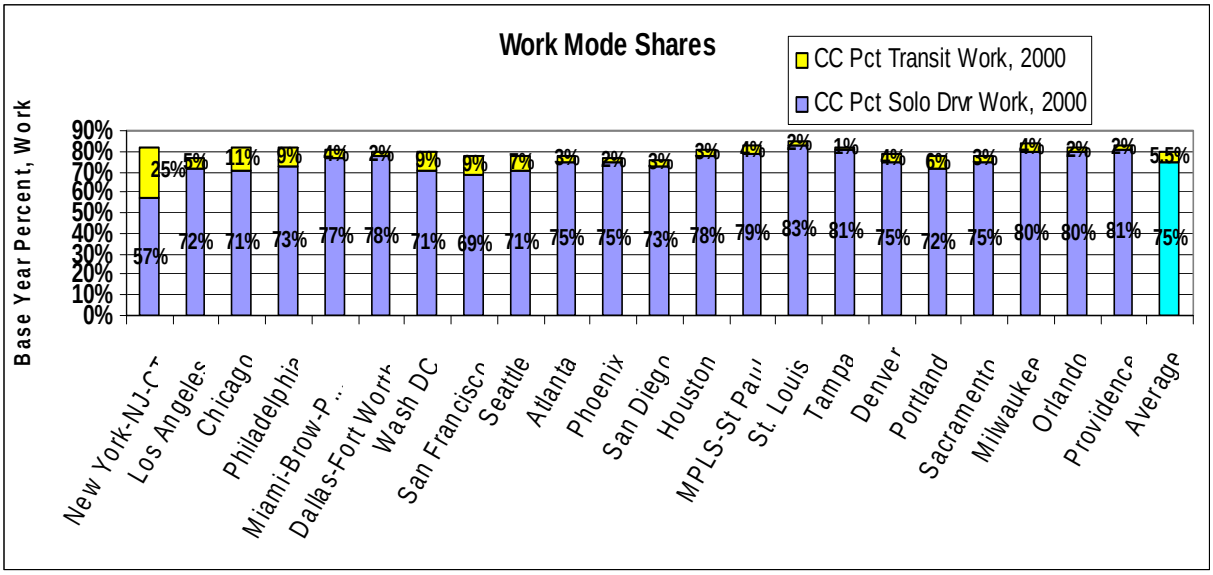
- *Constraints* on growth appear to be largely ignored. Two regions (Phoenix and Atlanta) mentioned water availability as a possible constraint, but no regions considered the likelihood of global economic or other changes resulting in slower growth. No region predicted that their present competitive advantages would weaken; they all forecast a "Lake Woebegone" (all above average) future.

- Commuting modal shares (central county) range from 57 percent solo driver/ 25 percent transit for NYC to 81 percent/1 percent for Tampa. On average, about 75 percent of work travel is solo driver, 13 percent carpool, 5.5 percent transit. Only four regions (NYC, DC, SF and LA) have central-area transit work shares greater than 10%[20]. (Suburban New Jersey and Connecticut have 11% transit shares to NYC; Chicago, Philadelphia and DC are 9%; Seattle 7%; all others <6%). Generally, transit shares increase slowly with increasing region size, but have also been falling historically as commuters have become more affluent. In spite of the

[19] In practice, the growth of nearby regions is handled through the use of 'external' traffic overlays describing traffic growth into, out of, and through the region. These are typically forecast by trending the traffic at the border crossings of the region, not by looking at the growth of nearby regions.

[20] From plans. The 2000 Census shows only 2 regions with a greater than 10 percent central county work transit share.

historically small transit shares, many plans put intense focus on changing travel behavior, particularly shifts of solo drivers from congested to 'priced' lanes.



- Regions use different ways of measuring congestion. Some regions use the Texas Transportation Institute measures (delay, travel time index[21]), but most use other measures such as average speed, volume/capacity ratios, percent of traffic in congested conditions, percent of system congested, maps of congested roads, drive time contours, or average drive times between key points. All regions show some current statistics and 21 of 22 forecast congestion in some fashion. The following table shows the wide range of measures used in the 22 regions. Better comparability would require agreement on measures and consistent reporting.

Measures of Congestion Used in 22 Long-Range Plans

Measure	Base Year	Future Year
Hours of delay (total, or per commuter)	14	14
Miles (%) congested by functional class	13	12
TTI Value for region	6	3
Average speed	7	7
Miles (or traffic) by V/C ratio	5	3
Level-of-service map	3	2
VMT (%) congested by functional class	4	3
Peak period VMT congested	2	1
Average commute time	2	2

[21] The 'travel time index' (TTI) is the ratio of the average travel time in the peak hour to travel time in the off-peak. So a TTI of 1.78 means that the peak travel time is 78% longer than the off-peak time. The 'delay' is the portion to the right of the decimal. Data from the Texas Transportation Institute, 2003. Source: http://mobility.tamu.edu.

Drive time between key points	1	1
Weekend congestion	1	0
Total	**58**	**48**

- Twenty-one of the 22 regions forecast congestion with Plan actions, but they do so in a variety of ways. For those that do, 18 show *worsening* congestion even if plans are built. Average speeds in LA, the most congested region today, are expected to drop even further, from 30 mph to below 20 mph. The NY portion of the New York region expects the percent of lane-miles congested to increase from 23 percent to 31 percent, and a 50-percent increase in the number of lane-miles congested. Northern New Jersey predicts "doubling" congestion, ranging from 15 to 200 percent increases on individual roads. In Miami, average speeds are expected to drop from 22 mph to 17 mph; Broward County (adjacent to Miami) predicts a 7-fold increase in commuter delay and a drop in speed from 38 mph to 32 mph. Tampa forecasts a 252 percent increase in delay. Washington, DC expects the proportion of congested VMT to increase from 21 to 31 percent. Atlanta expects the percent of congested freeways to increase from 25 to 34 percent. Minneapolis-St. Paul expects average commuter delay to increase from 28 hours per year to 37 hours per year. Portland foresees speeds dropping from 25 mph to 21. Orlando forecasts a near-doubling of congested mileage and a more-than-double increase in regional delay. Other regions, however, predict smaller changes: Chicago forecasts a modest increase in the percent of system congested, from 9.9 to 10.9 percent. Dallas-Fort Worth foresees a small increase in commuter delay, from 34.3 percent of free-flow travel time to 36.9 percent.

  In cases where the region's plan forecasts 'no build' congestion, the plan typically would marginally slow, but not reverse, the growth of congestion. San Francisco predicts a 1.7 minute increase in average travel time, if the plan is built. Denver forecasts that the number of congested lane miles will almost double but predicts only a modest increase in the percent congested, from 23 percent to **28** percent. Minneapolis-St. Paul predicts 42 hours of delay per commuter with no action, but 37 with the plan. Houston's plans will allow speeds to effectively stay even, but drop sharply without plans.

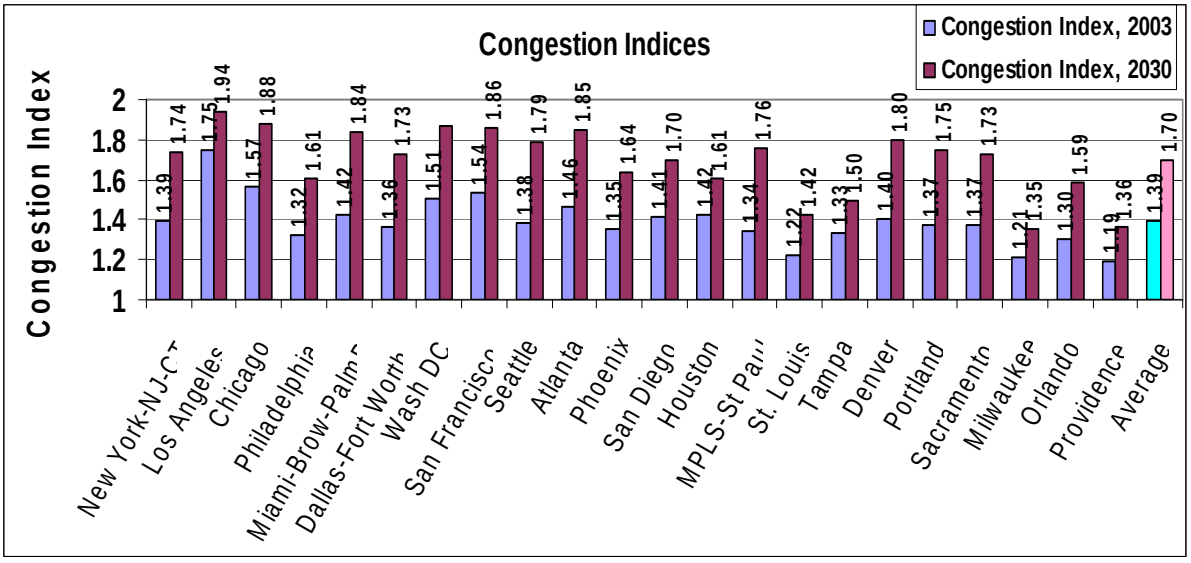
  In three regions (Seattle, San Diego, Milwaukee), the plans forecast improvement in freeway congestion from the base condition. In Seattle, freeway congestion during peak hours is expected to decline from 58 percent to 51 percent of system. San Diego predicts a drop from 29 percent peak freeway congested to 25 percent. However, in each of these cases a significant shift of solo drivers to managed lanes is predicted; given the traffic growth predicted for these regions (47 and 55 percent), the forecasts of congestion reduction seem highly unlikely. Milwaukee foresees a 36 percent increase in traffic, but also improvement from 290 miles congested down to 125 miles.

Measures and Forecasts of Congestion (ordered by VMT Growth)

Region	Percent TRAFFIC Growth to Future	Congestion, Base Year	Congestion, Future Year With Plan
Phoenix	125	Ave speed.32.1	Ave speed 27.9
Houston	113	Average speed 39.2	Ave speed 20.1 no-build, Plan 38.4
Orlando	71	707 mi deficient, speed 28.1, 538000 hrs of delay	1234 mi def, speed 24.2, 1393000 hrs of delay
Dallas-Fort Worth	59	34.3 % increase in travel time	36.9% increase in travel time, delay + 65%.
Denver	59	1459 lane-miles, 23.5% of system, 17% of VMT.	2638 lane-miles, 36% of system, 28% of VMT
Tampa	56	18.5% 'deficient' 158000 hours of delay	558000 hours of delay (+252%)
San Diego	55	29% freeway, peak	25% freeway, peak
Sacramento	53	3.4 m. hours of travel daily	158 % increase. 7.8 mil hrs of travel, 12% increase in total delay
Miami-Broward-Palm Beach	52	M: V/C 0.79, Speed 22.0 Br: 28% rds, spd 37.8, 110khd.	M:V/C 0.99, speed 16.5 Br: 35% rds, spd 31.5, 855khd.
Minneapolis-St Paul	51	28 hrs/year delay/ commuter	42 hrs/yr trend, 37 Plan
Los Angeles	50	Ave Speed 30, 2.2 mhd	Ave spd <20, 5.2 mhd
Seattle	47	Freeway 58% V/C >0.9	Freeway 51% V/C > 0.9
Atlanta	41	25% freeway congested	34 % freeway congested
San Francisco	40	Ave commute time 29.4 min, 124000 hrs of delay	Ave commute time 31.1 minutes
Portland	39	Av speed 25, travel time 13 min, 20.6% freeway congested	Ave Spd 21, travel time 15, 25.5 % cong. 15.9% freeway delayed.
New York-NJ-CT	36	NY: 23.1 % lane-miles NJ: miles congested CT: 38% of highways	NY: 30.5 % lane-miles NJ: 'cong. will double' CT: 39% traffic v/c.1.0
Milwaukee	36	290 miles congested	125 miles congested
Philadelphia	32	(TTI 1.32)	(TTI 1.61)
Washington DC	32	21% VMT pm peak	31% VMT pm peak
St. Louis	27	Freeway 32% of links delayed	
Chicago	21	9.9 % VMT congested	10.9 % VMT congested
Providence	19	51% (Freeway/principal arterial	"Slight increase"

- The only *comparative* regional congestion statistics presently available are the annual indices and estimates of delay-hours prepared by the Texas Transportation Institute[22]. Present (2003) congestion ranges from a high of 1.74 for Los Angeles to a low of 1.19 for Providence, and averages 1.39. Larger regions generally have higher congestion levels and longer commute times.

- Congestion indices have been rising steadily over time, according to the TTI reports. Comparative forecasts of delay for US regions have recently been prepared by the authors for the Reason Foundation[23]. This study forecasts congestion (with Plans built) by trending recent TTI values for each region, then adjusting for population and VMT growth against plan contents[24]. The results are generally similar the plan-based forecasts in the above table. Congestion (delay, miles congested, etc) is expected to *double* in most regions even with plans built, since most plans predict only small changes in capacity and mode shifts, while traffic is increasing 50+ percent. Increases will generally be less for large congested regions such as LA, but more rapid for smaller but faster-growing regions.



- Regional travel demand models generally show minor modal shifts resulting from the plan, although in some cases large *relative* shifts are foreseen. In the 22 regions reviewed, the largest predicted shift in to-work transit mode share was 6

[22] Lomax T and Shrank D, Mobility 2007, Texas Transportation Institute, May 2007. At http://mobility.tamu.edu.

[23] Hartgen DT and Fields MG, Building Roads to Reduce Congestion, Reason Foundation, September 2006. Available at www.reason.org.

[24] Although TTIs are for existing systems, not planned roads, the effect of new roads can be either calculated from data on planned projects, or estimated by trending. Since the projects in most LRPs would not account for more than 1-2 percent of regional road capacity, the plan's effect on an area-wide statistic like the TTI would be very small in most cases.

percentage points, from 12 to 18 percent (for Washington DC), followed by 5 percentage points, 5 to 10 percent (for San Diego), and 4 percentage points (3 to 7 percent, for Denver). Relatively, these transit *share* increases are 50 percent, 100 percent, and 133 percent, respectively. Sacramento predicts a tripling of transit *ridership* (and about a doubling of its 3 percent mode share). Northern New Jersey predicts a doubling of rail ridership. Orlando foresees an 84 percent increase in passenger-miles per capita, and Tampa predicts a 65 percent increase in ridership. However (with the exception of DC), all these increases are from presently small bases. The largest *non-transit* mode shift predicted by these 22 regions was for solo/carpool commuting in Portland, predicted to fall 3.3 percentage points from 88.3 to 85.0 percent of commuters. Several other regions forecast a 2-3 percentage-point increase in the transit share as a result of plans, but most do not report shifts or report very minor shifts. Given these forecasts, and recent reviews showing that transit ridership forecasts tend to be optimistic, it is difficult to accept assertions that congestion will remain static, or even rise only modestly, in the face of large increases in overall travel.

- A serious weakness in these plans, in our view, is the predicted response of commuters to 'priced' or managed lanes. These forecasts are based on mode choice models that use the trade-off between cost-to-use (tolls or fees) and travel time saving as the key variable, yet most regions have no priced lanes at present. We believe that these models essentially overstate the willingness of commuters to use priced lanes regularly and hence significantly understate future congestion[25].

- Only three regions (New York-NJ-CT, St. Louis and Providence) reported using data on the *condition* of roads or bridges, although trend data on bridge conditions is widely available by county (from the National Bridge Inventory), and road condition trend statistics are also available for the higher functional classes by county (from the national Highway Performance Monitoring System). Only one MPO (New York portion of the NY metro area) reported using a condition forecasting model for road and bridge conditions. These data sources appear to have not yet worked their way into transportation planning, even though a significant portion of needed funds are based on estimates of maintenance and reservation.

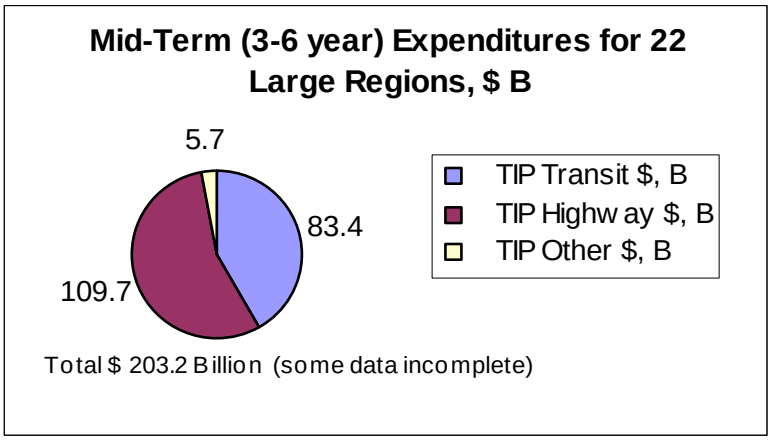
- The San Diego plan discusses immigration in the context of cross-border commuting. With the exception of St. Louis' plan, there was little discussion of immigration and its effect on growth.

[25] The models (termed 'multinomial choice' models) are 'random utility' share formulations from economics that estimate commuter mode choice (e.g., solo driver using a priced lane, solo driver using an un-priced lane, carpooler, transit rider, etc) based largely on time and cost differences between modes for specific point-to-point trips. Their weaknesses (e.g., assumed consumer knowledge of prices and travel times, failure to consider trip chaining and rising car availability, failure to consider reliability, lack of feedback to land use and trip distribution) are in theory well understood. But since only a handful of dynamic road pricing examples (SR-91 LA; I-25 Denver; I-394 Minneapolis) presently exist, there is little evidence of their general applicability. Unfortunately, no other tools are readily available.

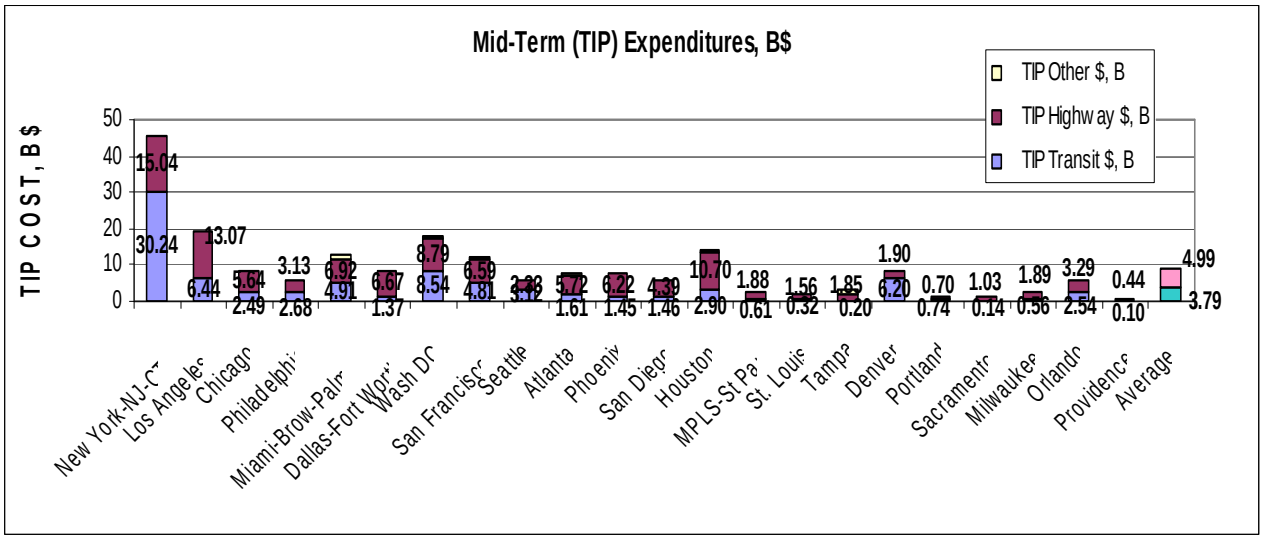
C. Mid-Term Plans

Mid-term transportation plans for states and urbanized areas are required by federal legislation. These plans, termed Transportation Improvement Programs (TIPs) are typically 3-6 year (now requiring 4 years as a minimum) programs of projects (all modes, operating/repair and capital/expansion) that have been approved by the MPO for implementation. Federal funds may not be expended on projects that are not on the TIP. TIPs are generally included as an element of the long range plans, discussed below.

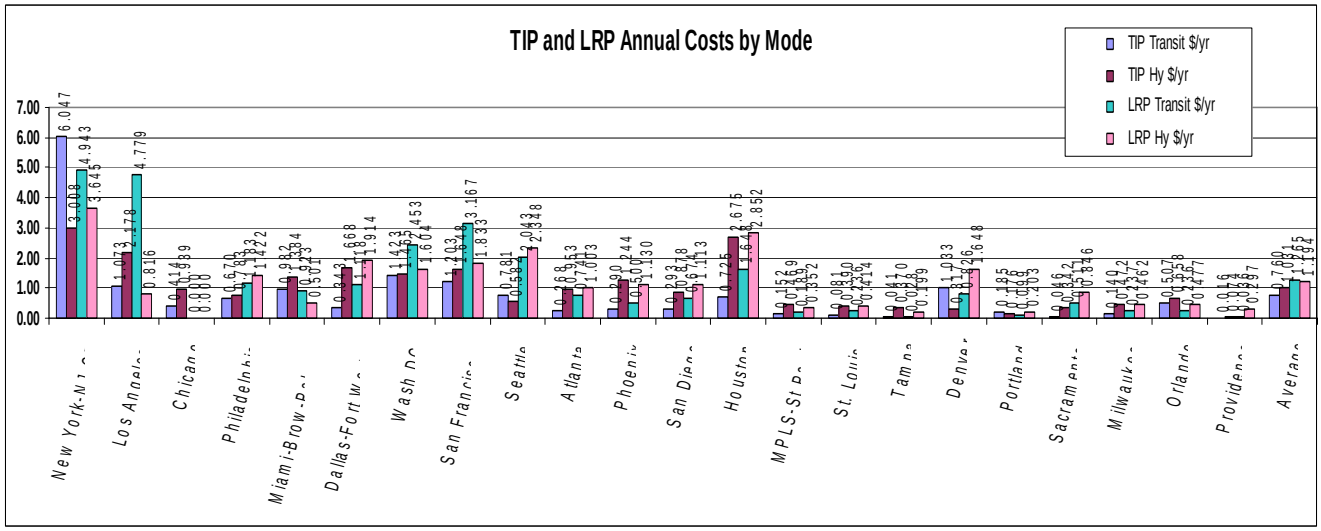
- For the 22 regions reviewed, total mid-term expenditures are estimated at about $ **203.2 B**. Of the modally identified funds, about $ **83.4 B** (42 percent) is slated for transit projects and $ **109.7** B is slated for highway projects.



- The average mid-term plan duration is 4.8 years, ranging from a low of 3 years to a high of 6 years (new regulations require at least a 4-year TIP). The average mid-term plan expenditure is about $ **9.2** B. However, the range is substantial, from a high of $ 45.2 B for NY-NJ-CT to a low of $ 531 M for Providence. Generally, larger regions have larger budgets.

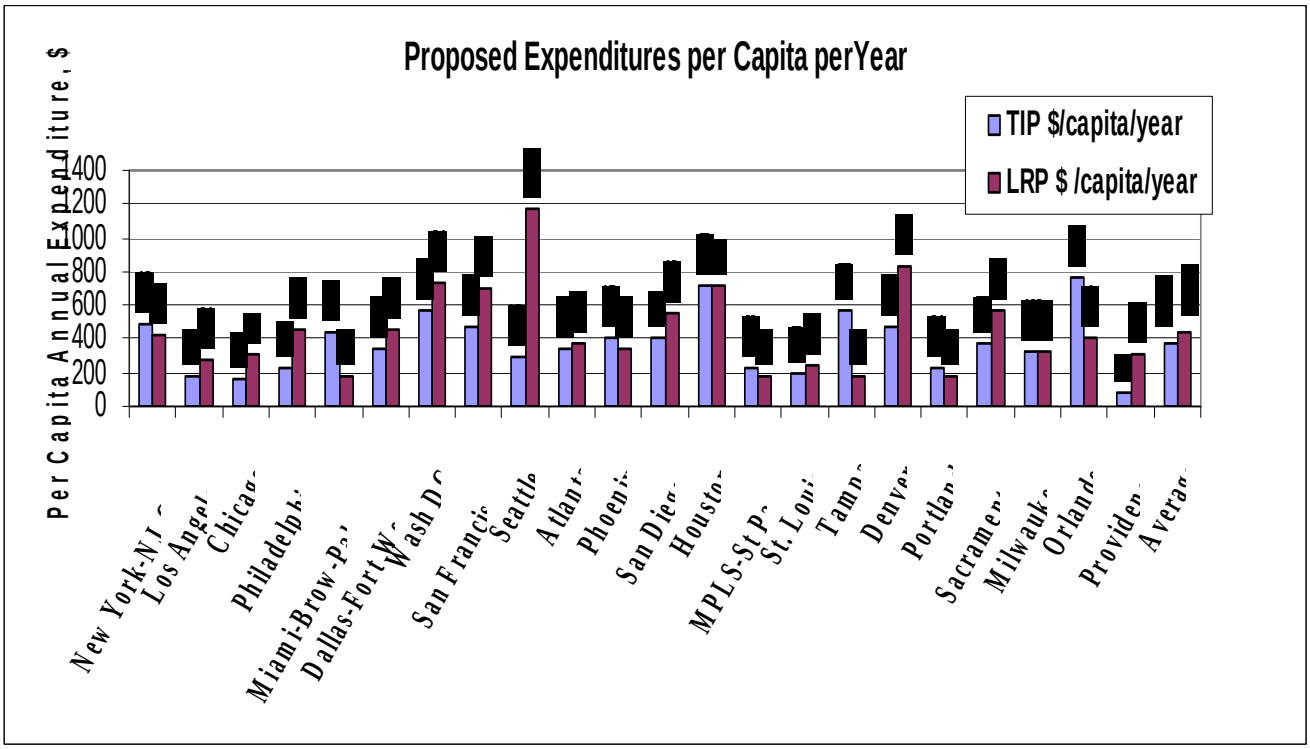


- Over 4.8 years, the average annual TIP expenditure is about $ 1.9 B/year. The average per-year transit expenditure is about $ 760 m, and the average annual highway expenditure is about $ 1.031 B.



- On a per capita per year basis, the average mid-term plan proposes to spend about $ 379/year[26]. However, per-capita annual expenditures also vary widely, from a high of $772/year for Orlando to a low of $ 83/year for Providence.

[26] This differs slightly from aggregate totals due to missing data for some modes.



- Mid-term plans are fiscally 'transit-heavy' relative to modal share; they average about 32 percent of funds on transit actions, compared with about 5.5 percent average transit work mode share. The percent typically increases with region size, and five regions (NY-NJ-CT, Philadelphia, Washington DC, Denver and Portland) propose to spend 50+ percent of mid-term funds on transit. Overall, however, transit funding averages about 32 percent, and highway actions account for about 63 percent of spending; other actions make up the remainder.

- Mechanisms for transit funding seem to have been largely established in most regions, while highway funding is less certain. Typically, transit projects are funded from a combination of local funds (e.g. 1/2 or ¼ cent sales tax, property assessment, etc.), state funds and federal funds. The local share of these is typically the largest. Most regions seem to be presuming that their 'new starts' proposals will be funded partially with federal funds.

- Of the 22 regions reviewed, all contained lists of projects, but only 7 summarized the project lists by count, mileage or other 'addition-to-system' statistics.

- Most regions prioritize projects within funding source, initially categorizing projects into likely funding category, then prioritize within each category. This may limit flexibility and reduce likelihood of funding the most cost-effective projects.

- Even though it averages a higher share of total costs, highway funding seems to be more uncertain. Typical major highway projects are funded primarily with state and federal funds, as opposed to local funds as are most transit projects. Most regions have one or more general-purpose major highway project, but also have several major HOT/managed lane widenings as part of the highway program. They also typically list numerous intersection treatments and preservation actions. In our review, we did not find any case that calculates the increment of road *capacity* (either in absolute or relative terms) created by these actions. Basic data on the effect of these plans on capacity and on traffic flow is not reported (for major projects, this data is in the regional traffic models).

- Both mid-term plans and long range plans often classify expenditures functionally, that is by *intended purpose*. These breakdowns vary widely in completeness and detail, however. The plans' treatments of functional expenditures are summarized in the following table.

  Of the regions reviewed, six are quite detailed in their use of functions (maintenance/operations, preservation, capital, and expansion) to describe the fundamental purposes of expenditures, by mode, for both the TIP and the LRP. The maintenance/preservation share of these budgets varies widely, from 3 percent to 88 percent, depending on system age and condition, climate, traffic, and expansion plans. Dallas-Fort Worth estimates expenditures by function/mode for both the TIP and LRP; overall about 30 percent of the TIP highway budget, and 30 percent of the LRP budget, is slated for maintenance/preservation, with a higher share on the highway side. In Los Angeles, the TIP has 21 percent of highway funds and 55 percent of transit funds slated for maintenance/preservation; the transit share increases to 66 percent for the long range plan. Minneapolis has about 30-35 percent of both budgets slated for maintenance/preservation. Portland has about 13 percent of mid-term highway funds and 24 percent of transit funds set aside for maintenance/preservation. San Diego has a higher share of mid-term highway funds, 31 percent, reserved for repairs, but a higher share of long-term transit funds, 62 percent. Seattle classifies TIP expenditures by three categories (capital, expansion, maintenance) and LRP by expansion, 'basic needs', and 'investment'. It has about 15 percent of mid-term highway funds reserved for repairs, but 34 percent of long-term highway funds so reserved.

  Seven other plans provide considerable but not quite as much detail, particularly for the LRP. Atlanta's plan breaks out the TIP by functional expenditure, but provides less detail for the long range plan. It reserves about 45-53 percent of long-term funds for repairs. Chicago's plan has a similar breakdown but is missing maintenance in the TIP; its LRP funds are targeted largely at repairs. Houston breaks out costs by function but not jointly by mode; it has 51 percent reserved for repairs. Sacramento has a similar percentage, 52 percent. San Francisco provides less detail for the TIP. However it has about 80 percent of LRP funds reserved for repairs. Washington DC provides detail, but only for one year, and also has 60-75 percent of funds so reserved.

Treatment of Expenditures by Function

Level of Detail	Region	Mid-Term Plan (TIP)	TIP Pct Maint/Pres	Long Range Plan	LRP Pct Maint/Pres
A	Dallas-Fort Worth	**Hwy:** Maint: $443.44 m. Expansion: $3574 m. Preservation: $333.19 m. Capital: $493.32 m. Estimated based on work category description Table VIII-1&2. **Transit:** Capital: $1036.9 m. O&M: $338.76m.	**Hy: 61** **Tr: 25**	Hwy O&M: 10.673 b. Transit O&M: 10.597b. Expansion: $42.57 b. Capital: $7.076 b.	**Both: 30**
A	Los Angeles	Transit: Improvements: 14% ($2.68 b), Op & Maint: 17% ($3.29 b). Hwy: Improvements: 50% ($9.75b), Op & Maint: 14% ($2.71b). Total: $19.531 b	**Hy: 21** **Tr: 55**	Hwy op & maint: $18.3 b. Hwy preservation: $6.5 b. Transit op, maint, rehab: $57.7 b	**Tr: 66**
A	Minneapolis-St. Paul	**Hwy:** Preservation: $521 m. Management: $119 m. Expansion: $968 m. Set-aside: $141 m. **Transit:** O&M: $246 m. Expansion: $254 m. Capital: $205 m.	**Hy: 30** **Tr: 35**	**Hwy**: Preservation: $2.244 b. Management: $1.32 b. Expansion: $3 b. **Transit:** Improvements: $4.15b. **Regional projects:** $ 0.793 b.	**Hy: 34**
A	Portland	**Hwy:** Exp: $136.7 m. Maint: $40.37m. Cap: $420.8m. Op: $119.5 m. Pres. $58.4. **Transit:** O&M: $179.2m. Cap: $38.9m. Exp: $520.4m.	**Hy: 13** **Tr: 24**	**State hwy:** OM&P: $819 m/yr in 2008, $1603 m/yr in 2035. Cap: $1232 m. **Regional streets:** OM&P: $171 m/yr in 2008, $450 m/yr in 2035. Cap: $4120 m. **Transit:** Op: $254 m in 2007, $899 m in 2035. Cap: $2672 m.	
A	San Diego	**Hwy:** Maint: $753 m. Expansion: $1194 m. Cap: $497 m. **Transit:** Maint: $293.5 m. Expansion: $1413.7 m. Cap: $1848 m. Op: $42.1 m. Estimated based on funding source.	**Hy: 31** **Tr: 9**	$42 b total; 23% Local Sts and Rds, 9% hwy expansion, 11% hwy o&m/rehab, 18% HOV/managed lanes, 13% Transit op, 20% Transit capital, 4% transit rehab/misc capital, 2% other.	**Hy: 18** **Tr: 62**
A	Seattle	**Hwy:** Capital: 3%. Expansion: 19%. Maint: 4%. **Transit:** Capital: 8%. Expansion: 59%. Maint: 2%. **Other:** Capital: 2%. Expansion: 1%. Maint: 1%.	**Hy: 15** **Tr: 3**	**Local rds and state hwys**: Expansion: $35.84 b. Basic needs: $18.42 b. Investment: $54.26 b. **Transit:** Expansion: $19.37 b. Basic needs: $27.47 b. Investment: $46.71 b. **Ferries:** Expansion: $480 m. Basic needs: $3.56 b. Investment: $4.04 b. Does not include regional needs.	**Hy: 34** **Tr: 59** **Ferry: 88**
B	Atlanta	**Transit:** Op: $482.15 m. Expansion: $410.5 m. Capital: $39.91 m. **Hwy, other:** Maintenance: $1.929 b. Expansion: $5.33 b. Capital: $65.99 m. Estimated based on funding source.	**Hy: 26** **Tr: 54**	**Hwy:** Maint: $13.421 b. Expansion & upgrades: $16.602 b. **Transit:** Capital: $10.06 b. Operations: $11.44 b.	**Hy: 45** **Tr: 53**
B	Chicago	Out of $12.2 b, $5.57 b for expansion, $5.53 b for improvement. Maint/pres. appears to not be included.	**Unclear**	72% maint., 7% shared use, 19% expansion	**Both: 72**
B	Houston	Total : $14.1 b; 20% Transit & livable centers, 13% operations, 2% TDM/Bike/pad, 65% System	**Both: 78**	Expansion: 36%, maint: 34%, preservation: 17%	**Both: 51**

Level of Detail	Region	Mid-Term Plan (TIP)	TIP Pct Maint/Pres	Long Range Plan	LRP Pct Maint/Pres
		development & preservation			
B	Sacramento	Hwy: Maint: $66.58m. Exp: $758.2 m. Cap: $316.8 m. Transit: O&M: $95.76 m. Cap: $19.5. Exp:$2039.3 m. Estimated from revenue sources. Transit expansion includes all local funds (unallocated in table).	**Hy: 6** **Tr: 4**	Hwy maint & rehab: $12 b. Hwy capital: $11.3 b.	**Hy: 52**
B	San Francisco-San Jose	Adequate maintenance: $6.1 b. Hwy Expansion and maint. identified separately		**Hwy & Local rds:** Maint: $33b (29%). System Efficiency: $3 b (3%). Expansion: $6 b (5%). **Transit:** Maint: $61 b (51%). Effic: $2 b (1%). Expansion: $13 b (11%)	**Hy: 79** **Tr: 80**
B	Tampa	Expansion: 71%, Capital: 23%, Maintenance: 5%. Based on federal funding categories only. Includes hwy, transit, air.	**Both: 5**	O&M: $2.162 b (68%). Cap: $97.3 m (3%). Expansion: $925 m (29%). Includes transit. Estimated from county revenue use tables minus unfunded needs.	**Both: 68**
B	Washington DC	Percentages based on 2007 totals: Hwy Improvement & Maint: 67.7%. Transit Capital: 18.5%. Transit Operating: 6.96%. Rideshare: 0.3%. Ped/Bike Improv: 1.76%		**Hwy:** Op & Preservation: $22.182 b. Expansion: $13.5 b. Other: $1.213 b. **Transit Rail:** Op & Pres: $3.918 b. Expansion: $1.196. **Transit bus:** Op: $30.934 b. Pres: $7.415 b. Expansion: $68 mill. Access & Capacity: $2.063 b. **New Starts:** $4.195 b. **Total:** $93.317 b.	**Hy: 60** **Tr: 75**
C	Denver	Not covered in TIP		**Hwy:** Preservation & Maintenance: $17.77 b. Operation/management: $1.34 b. Capital improvements/expansion: $5.815b. **Transit:** Service: $13.02 b. Expansion: $4.242 b. **Other:** $21.203 b.	**Hy: 77** **Tr: 34**
C	Miami-Broward-Palm Beach			M: Capital revenue: $5.56b transit; $5.43 highway. Operating revenue: $7.703 transit, $0.573 highway	**Hy: 9** **Tr 58**
C	Milwaukee	First year only: includes preservation and expansion		Hwy: Capital: $1073.0m. Op: $1740m. Transit: Cap: $725 m. Op: $449.5m.	**Hy: 62** **Tr: 38**
C	New York-NJ-CT	NY: Costs assume state of good repair NJ: Focus on preservation and repair		NY: Does not include $181 b in transit operating assistance NJ: focus on preservation and repair.	**Tr: 72**
C	Orlando	Not clear from funding source table.		Hwy O&M: $52 m. Transit: O&M: $941m. Capital: $735.3	**Hy: 0.6 %** **Tr: 56**

Level of Detail	Region	Mid-Term Plan (TIP)	TIP Pct Maint/Pres	Long Range Plan	LRP Pct Maint/Pres
				m.	
C	Philadelphia	Does not include $1 b for interstate maint.	**Hy: 30**	Hwy rehab ~ 1/2 of money, transit ~ 1/3	**Hy: 50** **Tr: 33**
C	Phoenix	Pavement maint: $49 million out of $7.7 billion total	**Hy: 0.6%**	Life cycle replacement costs	
C	Providence	Preserv: 52%, mgmt: 29%, Expansion: 12%	**Hy 52**	Not clear from funding source table.	
C	St. Louis	Includes transit op, preservation and hwy preservation. Major hwy/bridge unfunded		preservation 74%	**Both: 74**

Nine regions provide substantially less detail on functional expenditures. Denver provides no details for the TIP, although the LRP breakout shows about 77 percent of highway funds and 34 percent of transit funds set aside for maintenance. Miami-Broward-Palm Beach provides no TIP detail but some LRP detail and has a relatively small share of highway funds, 9 percent, set aside. Milwaukee's plan shows limited detail for one year of the TIP, but reserves 62 percent of LRP funds for repairs. New York's plan provides no detail for the TIP and does not include transit operating money; with that included, it would have 72 percent of transit LRP funds reserved for repairs and operations. Orlando reserves less than 1 percent of highway funds for repairs, while Philadelphia does not include Interstate maintenance. Phoenix's TIP has only 0.6 percent reserved. Providence provides no estimate in the LRP, and St. Louis has about 74 percent so reserved.

- It is difficult to judge the adequacy of these various functional expenditures, given differences in detail and definitions. Most regions do not forecast road and bridge conditions and agency 'force account' work (which is largely maintenance) is sometimes not included in plans. Nevertheless, even though some regions place considerable emphasis on it, preservation, maintenance and recapitalization actions seem to be lagging behind expansion. The 23+ year lifetime of the long-range plan is shorter than the expected life of major projects, so the *next* recapitalization of *proposed* projects is almost certainly beyond the planning horizon. In addition, recapitalization of existing roads and transit systems, particularly recent 'new starts', are also not generally included since they are also beyond the planning horizon. With a few exceptions (NY-NJ-CT, St. Louis, Providence, Phoenix) there is little discussion of the need to recapitalize the system that does not presently need work. Northern New Jersey with its "extensive but aging" system is the major exception. At least one region (Phoenix) has conducted a 'lifecycle' analysis of needs for transit and highways.

- General-purpose highway widening or new major highways are uncommon in large-region mid-term plans. The vast majority of highway projects are minor improvements, intersection improvements and safety, with few major widenings

(largely HOT/managed lanes) and a few new roads. However, where listed such projects may account for upwards of 10 percent of expenditures.

- Mid-term plans are primarily project lists rather than lengthy discussions, and specific funding mechanisms are generally not mentioned (funding sources *are* identified). However, public-private partnerships (PPPs) have worked their way in, particularly for toll roads or HOT/managed lanes; We expect this to be more frequent in the next round of plan updates, since by then PPPs will be more extensively used funding mechanisms.

- Not much money is being allocated for 'enhancements' or pedestrian-bike. CMAQ is bigger, but mostly going to smaller road improvements. The 'average' mid-term plan has about 4.5% of funding allocated to other-than-highway/transit projects.

- Although they are required to be fiscally constrained, some mid-term plans appear to be informally over-programmed, considering that they: 1. assume federal funding will be forthcoming for major transit actions, 2. assume increased state funding for roads, 3. assume continuing increases in federal funds, 4. put major projects in the out-years or in 'unfunded' categories, and 5. (until recently) do not consider inflation or rising construction costs. Although the TIPs may be 'constrained' from a regulatory perspective, they seem to be optimistic with respect to both cost and schedule. This may lead to delays as years go forward and to 'project mirage', the tendency for major projects to remain forever in the TIP out-years.

- Inflation was (until recently) largely ignored in plans[27], but recent plans include it as required by SAFETY-LU[28]. Inflation eats into dollar buying-power resulting in declining 'bang for the buck' from the dollars available. This is accelerated by recent sharp jumps in construction costs. The few recent TIPs that did include it (Philadelphia, Phoenix, San Diego, Sacramento) typically used 3-4%/year, which in our view significantly understate its effect on reduced buying power.

- We were struck by the wide range of formats and styles in the TIPs. Some were clear and straightforward with summary tables, but others were very difficult to follow and contained inconsistent or limited cost information. None of the TIPs we reviewed quantified the impacts of the expenditures on regional goals.

D. Long Range Plans

Long range transportation plans are federally-mandated documents intended to provide the regional 'vision' for transportation over 25-30 years, identify major initiatives and projects, and describe funding mechanisms. They are also required to be fiscally constrained. They must cover certain issues (termed the "7 planning factors", now 8 with

[27] Traditionally, transportation plans estimated costs and benefits in current dollars.
[28] The most recent federal transportation funding bill, January 2006.

security added), and other topics such as air quality conformity, congestion management, environmental justice and public participation.

- Most regions set goals first, though an outreach effort that solicits community input regarding the region's future but typically ignores fiscal capability. Not surprisingly, the results return numerous desirable transportation goals. This creates a disconnect between the goal-setting process and the dollars likely to be available. The following tables indicate the ranges of major goals mentioned in the 22 regions' plans. While important transportation goals are often mentioned first and dominate the list, they are also watered down by other objectives. This is a form of 'mission creep' that results in plans being written to partially fulfill all goals thought to be important, but achieving few or none satisfactorily. A second result is the temptation to use the goals list to argue that funding should be increased, even though rarely are plan dollars connected directly to goal achievement.

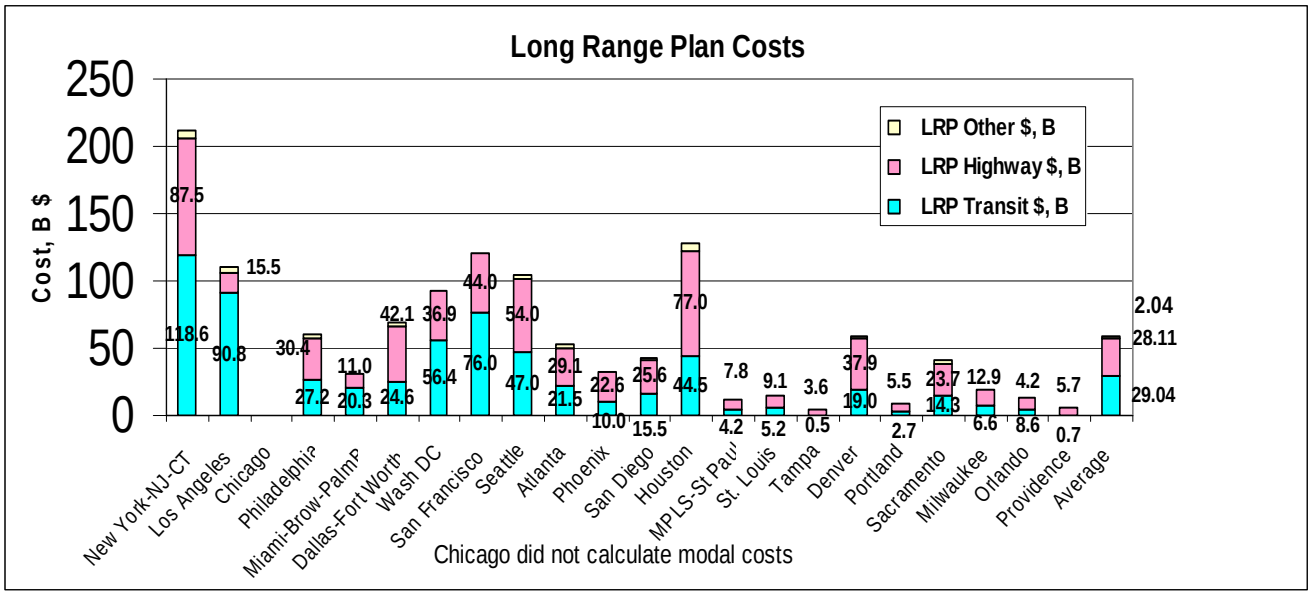
Top Goal for 22 Regions' Long Range Transportation Plans

Region	**Number One Goal**
New York NJ CT	Sustain the transportation system Protect environmental quality Safe, efficient, cost-effective, balanced
Los Angeles	Mobility: improve traffic flow, relieve congestion.
Chicago	Maintain existing infrastructure
Philadelphia	Improve safety, reduce congestion, rebuild infra.
Miami Broward Palm Beach	Improve systems and travel Balanced multi-modal system Focus on type and quality of services
Dallas-Fort Worth	Accommodate growth
Washington DC	Reasonable access at reasonable cost
San Francisco-San Jose	Safety
Seattle	Maintain existing infrastructure
Atlanta	Improve access/mobility options
Phoenix	System preservation and safety
San Diego	Mobility
Houston	Improve mobility, reduce congestion
Minneapolis-St. Paul	Accommodate growth
St. Louis	Preservation/maintenance
Tampa	Economic vitality
Denver	System preservation
Portland	Vibrant communities, efficient land use
Sacramento	Support smart land use
Milwaukee	Manage travel demand
Orlando	Integrated region/ balanced transportation system
Providence	Safety

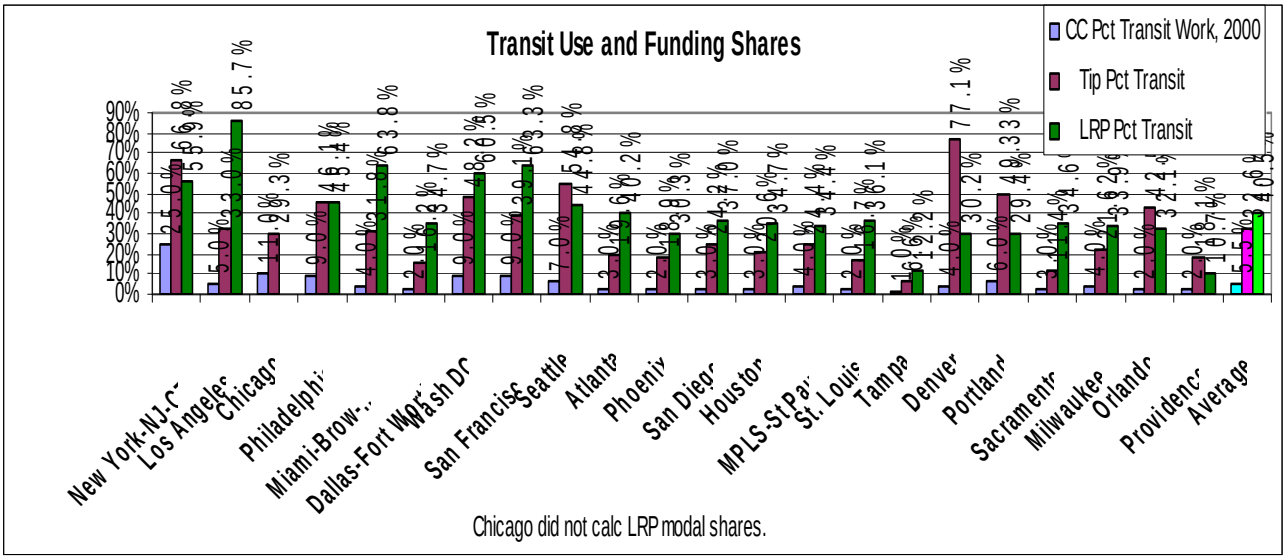
Major Goals in 22 Regional Long Range Plans

Goal Mentioned	Count
Improve accessibility or mobility	9
Maintain or preserve infrastructure or system	7
Improve performance or efficiency	6
Improve environment/air quality/energy use	5
Increase transit use	3
Reduce or manage congestion	3
Economic development or growth	3
Increase capacity	2
Integrate land use	2
Improve reliability	2
Support community values	1
Promote societal benefits or values	1
Provide choices or options	1
Connectivity	1
Prioritize projects	1
Financial prudence	1
Modal balance	1
Security	1
Quality of Life	1
Total	**51**

- The 'average' long range plan has about $ 59.26 B in proposed spending (current dollars) over 23 years, or about $ 2.6 B/year, somewhat more than the 'average' mid-term plan ($ 1.9 B/year). The plans range in cost from $ 21**2** B for the NY metropolitan area (which does not include $ 181 B in transit operations) to $ 4.09 B for Tampa. Five plans (NY metro, Los Angeles, San Francisco, Seattle and Houston) are over $ 100 B.

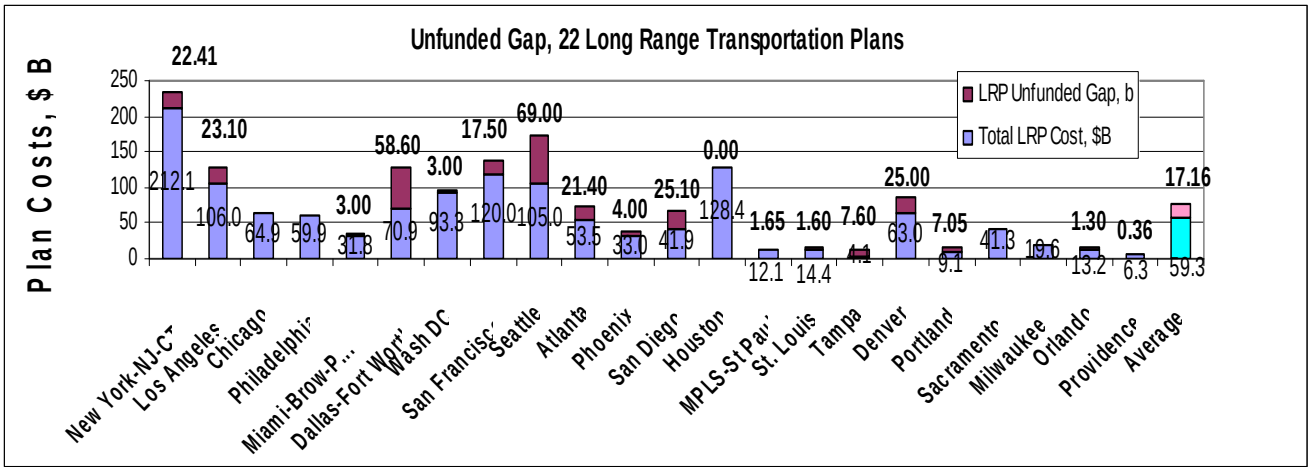


- On average, about 40.5 percent of funds are targeted for transit, and 56.**7** percent for highways. This compares with 3**2.6%** average funding transit share for the mid-term plans. So, regions are increasing their focus on transit expenditures going forward. The transit share of long range plan funding, 40.5%, averages about 7½ times the transit share of work travel, 5.5%. These relationships vary widely by region. Los Angeles has one of the largest differences, with a 2000 transit central county commuting share of 5 percent and 86 percent of LRP funds transit-oriented. Denver has a 2000 commuting transit share of 4.0 percent and a proposed TIP expenditure of 77 percent on transit-related projects. At the other end, the NY metro area has a transit commuting share of 25 percent and a LRP transit share of 56 percent, and Chicago has a commuting share of 11 percent and a TIP transit share of 29 percent. Part of these disparities are caused by the increasing cost of transit operation and maintenance, and part by the plans of regions for major capital expansions on the transit side of the ledger.



- Long range plans seem to be putting considerable hope on behavioral shifts to maintain mobility. Most proposed major actions are new or extensions of light rail transit and heavy rail lines, and HOT or managed lanes on highways. However, the changes in predicted modal shares are small relative to expenditures and to current shares, making increasing congestion and worsening accessibility likely. Most plans recognize this, predicting worsening travel times and lower speeds, increasing congestion, and small mode shifts.

- Even though long range plans are also required to be fiscally constrained, 17 of 22 regions estimated an additional 'unfunded gap', an additional amount needed to implement the LRP vision. The 'average' gap is $ 17.2 B ($ 292 B total), about 39 percent for those calculating it, but varies widely from a low of just 3 percent for Washington DC to a high of 186 percent for Tampa. The largest (absolute) estimated 'gap' is Seattle's $ 69 B, on top of a $ 105 B plan. Dallas's 'gap' is $ 58.6 B, on top of a $ 70.9 B plan. Denver's gap is $ 25 B, Los Angeles $ 23.1, New York's $ 22 B. Plans sometimes imply that without more money, they will not meet their stated goals.



- Most pricing actions mentioned are HOT/managed lanes, which are noted in numerous initiatives. Several regions (Seattle, DC, San Francisco, San Diego and Houston) place HOT or managed (priced) additional lanes at the heart of their freeway expansion and congestion management policy.

- Even with assumed funding, congestion is predicted to worsen in most regions; with funding delays, congestion will be even worse than predicted.

- Air quality will improve sharply in all regions, not because of plans but because of improvement from reduced auto emissions and fleet turnover. The following table summarizes the present and future status of air quality.

Air Quality Status and Forecast

	Status (from AQ plan)	**Future**
New York	NY is non-attainment for 8hr O3, NOX and PM2.5. However, emissions are expected to decline to 2030, by about 50-80%, and all are below budgets. The region is in conformance.	Will improve sharply.
Los Angeles	Understates the importance of fleet turnover in improving air quality; overstates the role of transit, carpools, and system efficiency.	
Chicago	Air quality is expected to improve as VMT is *reduced* (people drive less because of walk-able communities, shift to carpooling/transit/biking/ walking, or telecommuting) (the effect of fleet turnover is not discussed).	
Philadelphia	TIP and Plan confirm, and region is in 'attainment'. VOC predicted to decline by 505, NOX 80%, CO 30% to 2030. All are below the SIP budget.	
Miami	VOC will decline from 89 tons/day to 28. NOX from 139 to 24. Both will be below budgets. PM10 below budget, but closer to it. Region conforms, and will be in attainment.	Will sharply improve.

	Status (from AQ plan)	Future
Dallas-Fort Worth	Region is presently 'non-attainment' for 8-hr O3, but conforms. NOX emissions will decline by 70% and VOC by about 50%, and will be substantially below budget.	Will improve sharply in the future.
Washington DC	Region is non-attainment for 8hr O3 and PM2.5, but will emissions will fall sharply, by 70-80%, and will be below budgets.	Will improve sharply
San Francisco-San Jose		Forecast is for significant improvement.
Seattle	Reg. in attainment but has a few PM10 'maintenance' areas... TIP conforms. CO will fall to 1144 tons (budget is 2512 tons)	Emissions are projected to be less than 1/2 of 'budget'.
Atlanta	Severe non-attainment area for ozone	
Phoenix	TIP conforms. Portions are 'non-attainment' for CO, 8hrO3, PM10. In future, emissions will be 25-30% below present and below budget.	
San Diego	Presently non-attainment for 8hr O3. But forecasts show NOX dropping from 133 to 23 T/d, Co 425 to 136, ROG 73 to 17. All far below budget.	Improve markedly.
Houston	Non-attainment for ozone	
Minneapolis-St. Paul	Region is in conformity; designated as a maintenance area with some alerts for ozone and particulate matter in the past few summers. Implementing the central corridor transitway would show only slight reduction in CO emissions.	
St. Louis	Region conforms, but is non-attainment for 8-0hr O3 and PM2.5. However, predicts a 50-70% drop in poll to 2030, based on fleet turnover.	Improving
Tampa-St Petersburg	In compliance. Future emissions are lower than the adopted 2005 emissions budget. Carbon monoxide emissions are reduced by 11 tons per day with the Cost Affordable plan.	
Denver	Pollution has dropped sharply in the region since the 1980's, from 35-40 days a year over standards to just 1-3 days/year since 2000. All pollutant except PM10 will decline sharply in emissions. All will be below budget. Presently in attainment.	Will improve markedly
Portland	Maintenance Area for CO	

	Status (from AQ plan)	Future
Sacramento	$180 million for air quality; non-attainment status for ozone - 7th worst in the US	
Milwaukee	non-attainment	
Orlando	In attainment since 1990 Clean Air Act.	

Plans sometimes imply that they are at risk for air quality sanctions, but all are in conformance and most are in attainment or predict they will be.

- There is emerging evidence that congestion management plans and air quality plans are failures as policy initiatives. Congestion management plans typically *monitor* congestion rather than reduce it, and most regions predict worsening congestion. Air quality plans universally fail to reduce air pollution substantially, which is instead improving primarily through fleet turnover.

- A few plans are beginning to talk about climate change, but none specifically discussed CO_2. This is changing: a recent review noted 37 states are developing 'climate change' plans that address transportation and land use[29].

- Inflation has been largely ignored but is beginning to creep in as a result of the 'year of expenditure' requirement in SAFETY-LU. Several recent plans (Philadelphia, Phoenix, San Diego, Sacramento) computed inflationary effects on project costs, generally at 3-4% year. In one quantified case (Phoenix) this increased LRP costs by about 16 percent.

E. Major Initiatives

Major initiatives are significant regional or local projects or other programs that have the potential to significantly influence economic activity or transportation resources, change travel patterns, or influence land use. Generally their costs exceed $ 300 m, although some are less expensive. While there is obviously some judgment in determining what constitutes such an action, our review of the regions' plans generally found major projects clearly identified. In some cases, projects have several innovative features, such as funding and/or pricing. We developed lists of initiatives by reviewing TIPs and LRPs for major projects, contacting MPOs by email to capture funding initiatives that might not be on the TIP (only a few responded), and reviewing several years of weekly trade publications to identify other recent actions such as state or local legislative initiatives. Projects merely in the 'talking' or 'study' stage, as opposed to actually being funded, were generally not included. We did not look at non-transportation projects such as major development projects. While it is possible that some initiatives may have been overlooked, we believe that we have identified the major actions being discussed for each region.

The following table summarizes the initiatives mentioned. Overall, about 194 specific initiatives were identified in the 22 regions. Of these, transit light rail/heavy rail

[29] "States becoming testing ground for curbing global warming", AASHTO Journal, February 1, 2008. www.transportation.org .

(LRT/HR) actions were mentioned most frequently, followed by HOT/managed lanes and freeway widenings.

Major Initiatives, 22 Large US Regions

Category	Type	Mentions
General/Funding	State review of needs	8
	PentaP funding (transit PPP)	6
	Private-public partnerships	4
	Congestion reduction	4
	Local gov't review of funds/needs	2
	Auto pricing area/ zone	2
	Intercity corridor	1
	(sub)	**27**
Highway	HOT lanes/managed lanes	19
	Freeway widenings	17
	Toll sections or additions	12
	High-occupancy vehicle lanes	12
	Bridge replacement or new	11
	Major rehab or repair	7
	Tunnel	5
	Truck tollway or truck lane	2
	(sub)	**85**
Transit	Light or heavy rail (extension, new)	34
	Commuter rail extension	6
	Station repair or new station	7
	Commuter rail new	4
	Streetcar	2
	Bus on shoulder	2
	Arterial transit	1
	Bus rapid transit	1
	People-mover	1
	(sub)	**58**

Category	Type	Mentions
Other	Bike/pedestrian	8
	Airport runway/terminal/freight	4
	Land use, transit-oriented dev, Environment, Energy	3
	Border crossing	3
	Seaport access	3
	Passenger intermodal facility	3
	(sub)	**24**
Total		**194**

- The top highway-related initiatives are HOT lane/managed lanes and freeway widenings. Most regions were undertaking reviews of HOV/HOT lanes or had committed to major HOV/T expansions. A recently announced example is the PPP initiative in Washington, DC to develop priced lanes on the Washington Beltway, I 495. Freeway widenings are often toll and PPP initiatives. Several regions have also identified major new freeway links.

- The most frequently mentioned transit-related initiatives are light rail and heavy rail extensions or new routes. Many regions have both new transit lines and light rail extensions in their plans. In addition, several regions are upgrading their commuter rail connectivity and rehabilitating transit terminals.

- State-level reviews of funding are underway or recently completed in 8 cases. Many of these deal with ways to increase funding for highway needs, with additional considerations of transit needs. Both transit and highway PPPs are also being developed. We also found 2 congestion *reduction* initiatives (Texas, Atlanta), one congestion relief study (Seattle) and two auto-pricing zones being actively implemented (New York City, San Francisco).

- Several regions are undertaking major initiatives related to port access. One of the most ambitious is in Miami where access to the seaport via a new expressway is contemplated. Another is the 'Portway' truck access initiative in Northern New Jersey. Several regions (Atlanta, LA) are considering truck toll-ways. However, with the exception of St. Louis, there is little discussion of globalization, and no discussion of the effect of the widening of the Panama Canal on national container or rail/truck traffic patterns.

- In Seattle an $ 18 B referendum was defeated at the polls (November 2007), and a recent State Auditor's report is critical of congestion plans.

- With the exception of Dallas-Fort Worth, Houston and St. Louis's plans, there is little mention of cross-region or multi-state actions.

F. Other Observations

- The present balance in long range plans toward transit financing is analogous to the focus on Interstate spending 50 years ago, which then put attention on improving inter-regional and commuter links. Our analysis suggests that now, with attention increasing on congestion and capacity, it is time to revisit highway needs.

- The role of the transit system in the region's plan is an important feature in understanding the likelihood that these plans will succeed. The following table summarizes our assessment of regional plans, ordered by present transit work share. Of the 22 plans, 16 make specific forecasts for transit use or shares, which vary widely in size and impact.

  The 'legacy-large share' multi-modal transit systems typically have current work transit shares over 9 percent, and foresee slower-than-average traffic growth. The New York-NJ-CT region predicts only modest increases in core-area transit use, generally commensurate with growth in travel, while suburban portions of the region foresee substantial increases in transit ridership. The Washington DC plan foresees a 50 percent increase in its already substantial transit commuting share, from 12 to 18 percent. (Its air quality plan, however, foresees stable transit shares). San Francisco, with an 11.9 transit work share, sees overall ridership increasing about 60 percent, compared with 40 percent VMT growth. But Los Angeles, with an 11% transit work share but a newer rail system, forecasts only a slight increase in overall transit share. And Chicago, with a 9 percent transit work share, foresees a modest *decline* in that share. Philadelphia, with a 9 percent transit work share, does not make a forecast in its Plan. In these regions the transit system serves a substantial role in travel patterns and the increases predicted above would likely slow, but not reverse, the growth of congestion.

  Regions with newer systems and slightly lower transit work share, between 7 and 4.3 percent, foresee only modest increases in transit share going forward. Seattle, with a present transit work share of 7 percent, foresees that increasing just one percent to 8 percent, against a VMT growth of 42 percent. Portland, with a present share of 6 percent work and 4.1 percent overall, foresees a modest increase to 5.7 percent overall, versus a 39 percent in VMT. Miami, with a 4 percent work share, makes no overall forecast but, along with Broward's proposed people-mover, would make a significant investment. On the other hand, San Diego, with a present work share of 5 percent, forecasts a doubling of that to 10 percent versus a 55 percent increase in VMT. These forecasts are significant enough to visibly affect congestion but not reduce it.

  Regions with a lower present work share, between 2.5 and 4 percent also vary in their expectations for transit ridership. Milwaukee, with a present share of 4 percent, has a bus-only system which it hopes to improve with BRT service and eventually upgrade to LRT. Providence, with a present transit share of 2.5 percent, also has a bus-only system which it hopes to improve and add commuter rail service. Atlanta, with a 3 percent transit share, is planning fixed guide-way transit service on I75 and I285. On the other hand, Denver, Houston and

Sacramento, all between 3 and 4 percent present work share, have more ambitious visions for transit expansion. Denver hopes to increase its work share from 4 to 7 percent, Houston hopes to increase overall ridership 49 percent, and Sacramento foresees a tripling of its ridership. In each region, however, background VMT is expected to increase by 60+ percent; growth rates of this magnitude are likely to overwhelm the road system even with significant transit ridership increases.

Regions with a low present transit share (2 percent or less) have generally less ambitious plans. Orlando, with a present 2 percent share on a bus-only system, foresees a doubling of per-capita transit ridership (passenger-miles) if a 22-mile LRT line is added, but that line is presently unfunded. Dallas-Fort Worth, also with a 2 percent transit share, is planning a regional rail initiative that will extend LRT to UNT S. Campus and Waxahachie. Minneapolis, also at 2 percent work transit share, predicts a doubling of ridership if its LRT line is extended north through the University area. Phoenix, also 2 percent work transit share, is planning four LRT lines and 5 BRT lines. Tampa, at 1 percent transit share, foresees a 65 percent increase in ridership. On the other hand, St. Louis foresees slight decline in the transit share, from 1.85 to 1.78 percent. In none of these regions, however, would the predicted transit ridership visibly affect either present or future congestion.

Plan Strengths, Weaknesses and Transit Shares

Region	Strengths	Weaknesses	Transit Status (Wk share, Age, Modes)	Transit share Forecast
	"Legacy" Large-Share Systems			
New York-NJ-CT	• Modest pop (16%) and VMT (38%) growth. • Modest exp. requirements. • Pres/maint awareness. • Reg'l coop. on THE tunnel. • Downtown auto-pricing zone.	• Does not include transit operations ($ 180B). • Rising congestion. • Pres/maint costs • Assumes continued funding. • TIP hy $ 33%, LRP hy $ 44%. • Lack of reg'l plan	**25%, Old MM**	**NJ: rail rides double**
Washington	• Modest 23% pop and 32% VMT growth. Faster in subs • PPPs provide HOV/T frwy	• Congestion + 50%. "Stop and go" future. • Transit work share 13% to	**12.5%3.7% all, Old**	**18% (air qual rept 12%)**

	capacity. • Pres/maint covered.	17%. • Assumes SOA shift to HOV/T. • Transit capacity underfunded. • 49% TIP hy $, 40% LRP hy $. •	**MM**	
San Francisco	• Modest pop (29%) and VMT (40%) growth. • Pres/maint generally ok. • Transit share +3%. • Downtown auto-pricing zone.	• Constrained geography. • Faster sub/fringe growth, and fast core growth. • Assumes large shifts to HOV/T and transit, to hold cong. • 54% TIP hy $, 35% hy LRP $, • Most hy cap is HOT/V.	**11.9%, 5.6% all Old MM**	**Rides +59%**
Los Angeles	• Growth average (38% pop, 50% VMT). • TIP 67% $ highways • Identifies $ 23 B 'gap' • Pres/maint covered. • HOV to HOT conversion+ network.	• Delay will double, ave. spd decline from 30 to 20 mph. • TIP assumes -7% in SOA share (-4.6 to work at home). • Fastest growth in fringe. • LRP 82% $ transit. • Weak coord. with SD.	**11%, 4.7% all, New MM,**	**4.9% all**
Chicago	• Relatively slow pop (24%) and 21% VMT growth • TIP highway focus 67%. • Modest cong. growth. • 72% LRP $ for preservation	• No LRP modal $. • Focus on behavior shift. • Air quality impr. attributed to lower VMT. • Toll tunnel study	**9%, Old MM,**	**7.2%**
Philadelphia	• Modest pop (12%) and VMT (32%) growth. • Pres/maint partially covered. • PA hy funding initiative	• Modest cong. growth • TIP lacks Int. maint $. • LRP hy $ 51%, TIP hy $ 47%.	**9%, Old MM**	

	Newer Large-Share System			
Seattle	• 18% incr in frwy lanes, 239% incr in HOV/T lanes. • 75% TIP $ hy. • Pres/maint. covered.	• Fast pop (61%) and slow VMT (42%) growth. Faster in subs. • Large shift to HOV/T to relieve congestion. • Frwy cong. improves. • TIP $ 26% hy. • Transit work 7% to 8%. • $40 B. gap. • Spending rate doubles. 55% LRP $ hy.	**7%, 2.6% all, New MM**	**8%**
Portland	• Increased transit share. • Growth cordon • 61% hy LRP $. • New toll river crossing.	• Faster pop growth (53%) than VMT (39%), sub. gr. fastest. • Long-dist travel. • Delay increase 156% • 47% TIP hy $ • $ 7B unfunded gap.	**6%, 4.1 all, New MM,**	**5.7% all**
San Diego	• Average pop (37%) and VMT (55%) growth. • Pres/maint covered. • 73% TIP hy $. 61% hy LRP $. • HOV/T managed lanes • Air quality improves. • ½ c for projects.	• Assumes large shifts to HOV/T and transit ("double digit"). • Cong will FALL in LRP. • Rapid fringe growth. • Weak tie with LA. • Assumes higher S+F $.	**5%, New MM,**	**10%**
Miami-Broward-Palm Beach	• Ave pop (40%) and VMT (53%) growth. • Tolls and managed lanes for hy expansion.	• Lack of reg'l planning. • 45% TIP highway $. • 35% LRP highway $. • Cong. more than double. • Over-reliance on transit mode shifts. • Broward people-mover. • Pres/maint. not addressed	**4.3%, New MM**	**4.7%**
	Lower-Share Systems			

Milwaukee	• Low pop and VMT growth (18%). • Progress on congestion. • Pres/maint major TIP focus • TIP 73% highway focus, LRP 66% highway.	• Focus on behavior change. • 1-year only for TIP. • Transit $ excessive.	**4%, Old B**	
Denver	• $ 63 B plan • Air pollution declines • Gov's funding review • PPP and managed lanes	• Fast growth, 47% pop, 59% VMT. Proposes growth boundary. • Optimistic transit shift, 4% to 7%. • Cong. will double, mostly in suburbs. • TIP 77% $ for transit, LRP 30% $ for transit. • Preservation not in TIP	**4%, New MM**	**7%**
Atlanta	• Congestion analysis, focus and reduction goal. • TIP hy $ 70%. • Air quality improves • Pres/maint covered.	• Fast pop (61%) growth, but VMT less (41%). • Beh. Shift fr. HOV to HOT may not work. • Rapid suburban growth. • LRP 60% hy $. • Plan effect on congestion	**3%, New MM,**	
Houston	• TIP 78% highway, LRP 60%. • Includes inflation in costs. • Faster suburban growth. • Pres/maint in TIP and LRP • Toll funding for highways. • Modest transit focus vs. use.	• Extremely rapid growth, 87% pop, 113% VMT • Optimistic plan effect on congestion.	**3.3%,New MM**	**Rides +49%**
Sacramento	• 78% of TIP hy $ • Major hy. Expansions • HOV initiatives • Pres/maint covered.	• Fast pop (48%) and VMT (64%) growth. Faster in suburbs/fringe. • Cong. will double. • Low transit share (3%) • 57% LRP hy $.	**3%, New MM,**	**Rides triple**

Providence	• Slow pop (8%) and VMT (19%) growth. • Focus on condition/repair. • 76% TIP hy $, 89% LRP hy $. • Slight incr. in congestion.	• High % of def. roads and bridges. • 63% of TIP exp $ to rail.	**2.5% Old B,**	**3% Overall**
	Low-Share Transit Systems			
Orlando	• Major hy widening projects. • LRP 65% hy. • Managed frwy. Lanes	• Understates sub growth. • Fast pop (53%) and VMT (71%) growth. • TIP $ 57 % hy. • Pres/maint TIP $. • Cong. will double. • 22-mi transit LRT unfunded.	**2%, Old B**	**+84% pm/cap**
Dallas-Fort Worth	• Inter-regl. corridors • TIP 78% highway $. • LRP $ from pricing. • LRP 60% highway $. • Gov focus on cong red. • Pres/maint in TIP and LRP	• Fast 45% pop and 59% VMT growth • Most growth in outer Cos • 44% incr. in pk. cap. • Increase in congestion • HOT/toll focus. • $ 32 B rehab 'gap'.	**2%, New MM,**	
Minneapolis-St. Paul	• Average pop (36%) and VMT (51%) growth • 20% incr. frwy lane-miles • 75% Hy TIP $. • 67% Hy LRP $. • Hy pres/maint covered. • I35W replacement.	• Rapid suburb growth • Doubled transit use. • Delay will incr. 50%. • Transit $ unavailable • Transit pres/maint.	**2%, New MM**	**Rides Double**
Phoenix	• 81% TIP hy $, LRP 59% hy. • Focus on capacity provision • 1/2c sales tax for frwy exp.	• Rapid pop (77%) and VMT (125%) growth. • Spd drop 32 to 28 mph. • Very rapid sub. growth.	**2%, New B**	
St. Louis	• Slow pop (10%) and VMT (27%) growth. • Pres/maint focus. Condit. data.	• Faster sub. growth. • Major new bridge unfunded.	**2%, 1.85 all, New**	**1.78% all**

	Economic strength. • 77% TIP hy $. 63% LRP hy $. • I70 'Corridor of the Future".	• Funding gap $6B.	**MM**	
Tampa	• 1% transit share. No LRT. • Pres/maint covered. • 60% TIP hy $, 88% LRP hy $. • Add capacity to hys.	• Fast 53% pop and 56% VMT growth. Faster in fringe. • Delay incr. 252%. • 'Constraining' some rds. • Lack of a reg'l plan (with St. Petersburg).	**1%, New B,**	**Rides +65%**

- In our view, large-region transportation plans are strangely unsatisfying documents, full of planning and regulatory jargon, ignoring or downplaying predicted growth, and mostly containing inadequate responses to it. If they were 'business plans' or 'strategic directions documents', most would be rejected as impractical and perhaps even naïve.

- Transportation challenges are complex and have numerous dimensions. Solutions for transportation topics such as system preservation, safety, congestion, accessibility, mobility and economic impact are often at cross-currents with security, aging populations, air quality, and environmental protection. As a result, no single-goal plan can, nor should, be adopted. On the other hand, some semblance of order and progress should also be made. It is extremely frustrating for commuters stewing in traffic to see even simple improvements take years and larger ones take decades. Yet regional transportation plans are being called on to improve the quality of life, reduce air pollution, foster economic development, densify land use, AND provide access and mobility. Many other planning areas have these dimensions too, but transportation is one of the few areas that have this over-arching multi-pronged federal mandate through SAFETY-LU and its predecessors. Maybe we are asking too much of them and are setting ourselves up to fail. It is our view that transportation funds, and focus, should be on transportation problems, not on other goals, however worthy, that are not directly germane.

- Cities have been growing outward since the dawn of civilization. In the US, the first 200 years (1780-1980) were mostly a 'keep up' philosophy in which road mileage and transit services were added to accommodate growth, but since 1980 most regions seem to simply accept, or even welcome, higher densities and higher congestion. Cities were much denser and dirtier in the past than now. After many years of generally improving congestion, it began to worsen again.

- Air quality will improve sharply in spite of mid-term and long range plans. This is because most regions have less than ½ percent improvement in air quality (emissions) attributed to the LRP, compared with a 50-70% improvement due to fleet turnover. Air quality is improving sharply (fleet turnover), and vehicle fuel efficiency was recently addressed at the federal level. CO_2 emissions are a topic of study and some (particularly west coast) MPOs are beginning to assess it. But CO_2 emissions are not presently part of air quality planning requirements and it is certainly less than clear whether anything a region could do regarding CO_2 emissions would have any effect on global climate change. It is probably wasteful and inefficient to saddle transportation plans with these additional responsibilities. A major re-thinking of planning requirements for both air quality conformity analysis and for congestion management is overdue.

- A fundamental issue is the structure of MPOs. They are composed of modal agencies and geographic jurisdictions, but no one organization is responsible for most cross-cutting issue like congestion, safety or air pollution. Projects tend to get prioritized by modal funding categories, and are not compared for cost effectiveness across modes. Funding tends to go directly to agencies by mode, either from the federal government or the state. (The irony in most states is that the transit projects get their federal and state dollars largely from highway revenues). The result is individual modal agencies largely calling the shots on modal priorities, within budget constraints. Overall, this results in some agencies (those with a steady funding stream) having modest fiscal capability, others with limited funding capability. An alternative functional or 'matrix' organization (e.g. Dept. of Preservation, Dept. of Capital Actions) might be harder to administer but could ensure better project comparisons and more uniform cross-modal funding.

- Another key issue is the geography of MPOs. In most of the regions we reviewed, these geographies were too small to consider adequately the *de facto* commuter shed of the region. In regions with several MPOs, the problem is even more serious because the component geographies are all too small for effective regional planning. And multi-region or cross-state initiatives are largely ignored[30]. Since the treatment of large multi-centered regions is clearly beyond the scope of most MPOs, perhaps an expanded 'business model' for planning in these regions is needed.

- Another important issue is the wide variation in plan quality and content. We found some plans largely complete and readable (St. Louis is an example), others missing even basic data such as a table of revenues and expenditures, or tables of growth in traffic, population or employment. In one case (Chicago) basic data on expenditures by mode were not available, in others no summary table provided the information leaving the reader to struggle with basic questions. In regions with multiple MPOs, separate incompatible documents make 'regional'

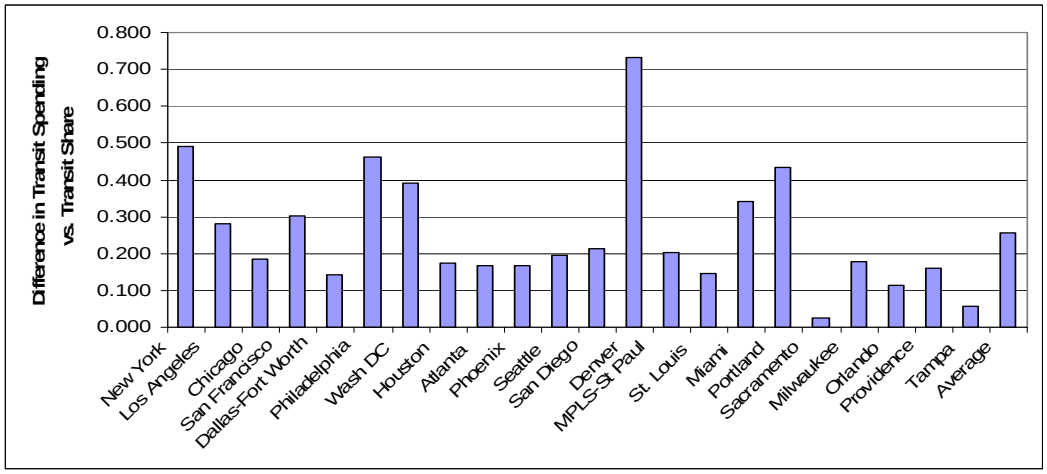
[30] The federal government has recently initiated a 'Corridors of the Future" initiative dealing with multi-state traffic. Six corridors (I 95, FL-VA; I 70, MO-OH; I 15, AZ-UT; I 5, CA-WA; I 10, CA-FL; I 69, TX-MI) have been initially identified for study.

summaries difficult. Very few plans even discussed, let alone calculated, the actual effect that the proposed expenditures would have on the future. Documents also contained numerous examples of inconsistent tables showing different numbers. Excessive planning jargon muddies the documents and makes them largely unintelligible to lay readers. Transportation plans, it seems, have deteriorated into regulation-driven mechanisms for ensuring planning certification and continuing flow of dollars, dotting the 'i's' and crossing the 't's' of federal regulations, rather than soberly assessing the future and how to get there.

- An important background issue is the philosophical approaches underlying these plans. A 'predict and provide' philosophy, more common in earlier transportation plans but not widely used today, uses transportation funds to respond to the projected needs of the people based on expected behavioral patterns. This philosophy tends to support the allocation of funds to the various modes based on modal usage, and in most cities in our study group this would mean allocating larger sums to the highway system and smaller sums to the transit, bike/pedestrian, and other modes. The second philosophical approach believes the 'predict and provide' philosophy is unsustainable, inequitable, too costly, or otherwise undesirable. This 'behavior change' approach, which uses transportation funds to change travel behavior so that it can be more easily accommodated in the future, tends to support the allocation of funds to the various modes based on an overarching vision of what the future should be rather than on current or projected modal shares. The vision that currently seems to dominate regional planning agencies is that of higher densities, increased reliance on mass transit, and reductions in VMT.

  The plans studied are largely written using the 'behavioral change' approach, as most assume that significant shifts in transportation spending from the most heavily used mode (highways) to less used modes (transit, bike, and pedestrian) will be accompanied by a significant change in travel behavior. For example, the chart below shows the disproportionate spending for transit projects in relation to the use of transit.

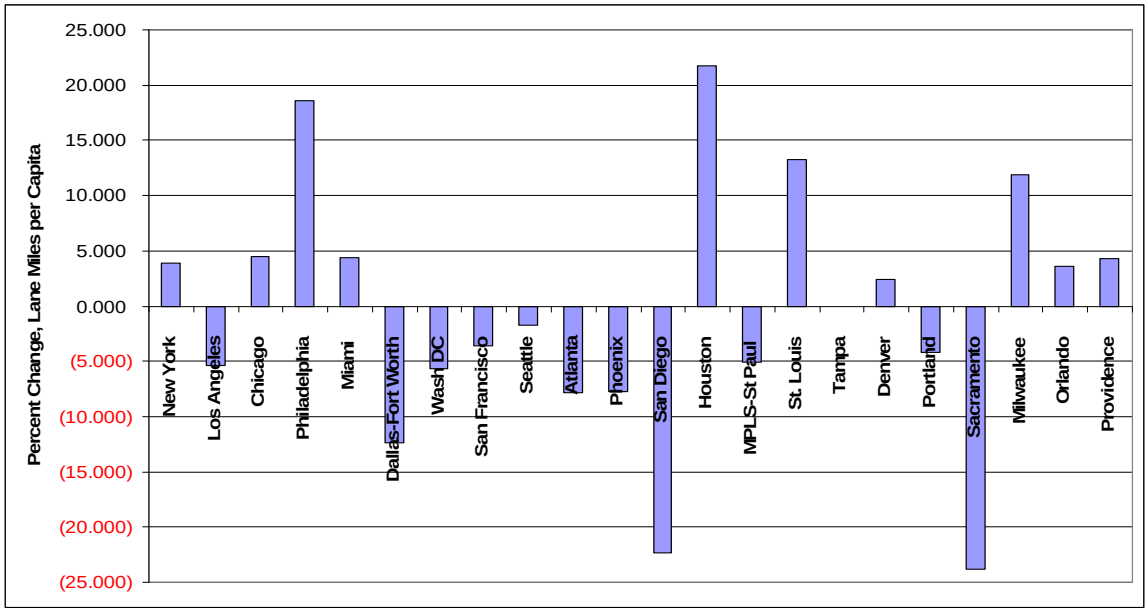
Transit Spending in Relation to Transit Usage



However, the effectiveness of the regional plans in accommodating future growth cannot be assessed from either perspective alone. We looked at regional plans from the 'predict and provide' approach and, as noted in the discussion above, found them severely lacking. This is understandable since the plans seem to be written from the 'behavioral change' perspective. But they also seem lacking from that perspective as well. Much of the appeal of the 'behavioral change' philosophy flows from the adage that "we cannot build our way out of congestion". This notion seems based, at least in part, on the observation that whenever new roads are built, they immediately 'fill up' which seems to reinforce the idea that reducing costs (in this case, travel time) will induce more people to consume more (in this case, to drive more). This argument seems to forget that travel is, for the most part, a derived good – one does not travel for travel's sake, but to go to some destination worth going to. So people don't travel simply because there is a new road, but because there are new or closer opportunities to pursue. And the rapid 'fill-up' of the roads that we observe is simply the response to latent demand.

We are just not keeping pace with the growth of travel demand. We cannot say that "we cannot build our way out of congestion" – we really haven't even tried. Road mileage has generally not kept pace with population growth. As noted in the chart below, during the period 1995-2005, over half of the cities in the study (12 of 22) lost ground in keeping up with growth, seeing declines in lane-miles per capita from 23.8% in Sacramento to 0.1% in Tampa. Of the remaining cities, only Houston, Philadelphia, St. Louis, and Milwaukee made real gains in this area, and this was largely through annexation as regions added mileage in surrounding areas.

Lane Miles per Capita, 1995-2005



The 'behavioral change' perspective is that investments should be made in other (non-highway) modes in the belief that if more options are provided, people

will change their travel behavior. But this has not generally been the case. Despite significant investments in transit, bike paths, and sidewalks, people continue to prefer to drive cars, and moreover, drive them alone. Transit mode shares across the nation have declined in most areas, although many have also seen increases in light rail/heavy rail commuting. Recent analysis, cited above, suggests that transit use in 'new starts' has been significantly over-estimated and costs under-stated, although the problem seems to be less than in the past. There is no evidence to suggest that continuing along the present path will produce any outcome other than what we have experienced thus far. Indeed, it is likely to accelerate as regions spread and suburban growth increases.

- Weaknesses and inconsistencies in the formats and content of transportation plans suggest that they might need more structure. One approach would be for the federal government to provide 'templates' similar to the Highway Performance Monitoring System and the National Transit Database reporting systems, along with a guidance manual, identifying specific items that need to be prepared in a consistent format for both TIPs and LRPs. MPOs would then provide specific tables (a la the HPMS annual reports) showing revenues by source, expenditures by type and function, present and future conditions, modal shares, etc. Plans might also include significant 'beyond the horizon' recapitalizations that are known to be needed. However, the guidance could go further, linking dollars to performance, showing performance change and what is causing it. This would facilitate comparisons between regions and assessment of expenditures on goal achievement, thereby permitting program evaluation.

- We also believe that planning guidance should de-couple air quality conformity from transportation planning. Air quality improvements will be substantial because of fleet turnover, not transportation plans. Conformity analysis is essentially an academic exercise.

- In summary, we suggest that if the US expects to avert commuting disaster in the highway system and economic weakness in major regions, the time has come to take broad ownership of cross-modal issues such as congestion, accessibility and safety. As we have done recently regarding education, this will require sober and realistic assessment of circumstances, effective plans, monitoring and accountability.

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Appendix B: Biographies and Acknowledgements

David T. Hartgen, Ph.D., P.E., is Emeritus Professor of Transportation Studies at the University of North Carolina at Charlotte, where he established the Center for Interdisciplinary Transportation Studies and now conducts research in transportation policy. He recently established The Hartgen Group (www.hartgengroup.net), a transportation planning and policy research organization. He is the author of about 335 publications on a wide variety of topics in transportation policy and planning, is US Editor of the international academic journal *Transportation,* and is active in professional organizations. He is a frequent media interviewee in local and national publications. Before coming to Charlotte in 1989, he directed the statistics and analysis functions of the New York State Department of Transportation and served at the Federal Highway Administration. He holds engineering degrees from Duke University and Northwestern University, has taught at SUNY Albany, Union, and Syracuse, and lectures widely. He has completed a wide range of transportation assessments, studies of sprawl, road condition, and growth and economic development. In 2006 he reviewed the performance of North Carolina's largest transit systems (www.johnlocke.org.) His recent nationwide study of congestion for the Reason Foundation, (www.Reason.org/ps346.), and his 16th annual review of the 50 US state highway systems (www.reason.org/ps350) have received wide national attention.

M. Gregory Fields is a graduate student at the University of North Carolina at Charlotte pursuing a Ph.D. in Geography and Urban Regional Analysis. A retired US Army officer, he holds a BS degree from the US Military Academy, MA degrees from Webster University (HR Development) and UNC Charlotte (Transportation), and an MS degree from UNC Charlotte (Earth Sciences). He has contributed to several transportation studies including a review of the cost-effectiveness of North Carolina's highway projects, county-level road condition trends in North Carolina, a review of South Carolina's traffic modeling systems, Reason's recent nationwide study of congestion, and economic impacts of highway investments.

Claire G. Chadwick holds a Bachelor's degree in Geology from the University of Florida and a Master's in Geology from Idaho State University, through which she gained valuable research and spreadsheet management experience. She has contributed to several recent transportation studies, including a review of the transportation systems of the Canadian Provinces.

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Appendix C: Summary Data Table

This appendix contains summary data table for all 22 regions in the study.